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F.C.

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Lowly trees at a mile and a half from Rest, but apparently of considerable size, and [illegible] in which to [illegible] more.

We entered [illegible] the shelter and [illegible] across the mountains to Jerusalem on [illegible] and [illegible] on [illegible] of the Mountain ridge. Shortly [illegible] we reached the [illegible] of the mountain [illegible] [illegible] [illegible]

leagues to Saari. Half a mile beyond Saari near the sea shore we saw in passing an adit dug and abandoned about 10 ft. said to be about 900 yards long, and [illegible] for coal of which a weathered specimen [illegible] near proved to be woody fibred lignite [illegible] that of the Yoshibiro rocks in Yesso. The adit was too full of water to enter far and I did not see the lignite in place; but from the description given on the spot it would appear to be only 0.3 ft. or 0.4 ft. thick, and of course would be wholly unworkable, as it had proved on trial. The [illegible] was a greenish brown clayey shale with layers of egg sized pebbles; and the dip was about 45° north about 55° west. There was said to have been two other holes close by, on either side but both were now fallen in, and they had found only the same amount of lignite! This thoroughly worthless deposit is a main part of the foundation of the most extravagant impressions that have got abroad in regard to the existence of a very large coal field in [illegible]

L 2369a { Osaeri village, 1 ri from Yagen + 1 ri from Koeda, near Seeda. Chiisagata dist. Shinano.

L 6026c Tanketate, Kurihara dist. Rikuzen

L 14452i Inaari, Ibi dist. Josa Province.

L 14640k Near Nakasuji, Awaji pine. Mihara dist. Awaji Ne.

L 1131u Horumui River, Yezo. Sorachi dist. Ishcari.

L 1570k Rehashi, near Tomamai Tomamai.

L 1583s Herashibets River, 1/12 ri below the coal ~~[illegible]~~ mine. Rurumappe dist. Tesio [illegible]

Station	Place	District	Province	Island	Number of specimens.
Z 552 a	Makumbetsu	Shidzunai	Hidaka	Yesso	1
——	"	"	"	"	1
——	Shidzunai	"	"	"	3
——	Shiranuka.	Shiranuka	Kushiro	"	3
——	Yutoromap	Rurumoppe	Teshio	"	1
K 1370 b	Naie	Sorachi	Ishcari	"	4
K 1370 d	Naie	Sorachi	Ishcari	"	1
——	"	"	"	"	1
Y 721 a	Bibai	"	"	"	1
Y 721 c	"	"	"	"	17
B 883 c		"	"	"	6
B 884 k		"	"	"	4
B 932 № 4		"	"	"	1
E 444 6a		"	"	"	2
U 603 e		"	"	"	1
Y 552 d	Nuppaomanai	"	"	"	2
Y 610 pa	"	"	"	"	2
K 948 w	"	"	"	"	1
K 955 a	"	"	"	"	22
Y	Kumumbetsu	"	"	"	1
O	Musa	Fukushima	Oshima	"	1

Station	Place	District	Province	Island	Number of Specimens.
L	Oiso	Yurugi	Sagami	Nippon	1
L2369 a	Osaeri	Chiisagata	Shinano	"	1
L6026 c	Tsukitate	Kurihara	Rikuzen	"	1
L11001 u	Amanohashidate	Yosa	Tango	"	2
L14452 i	Isaari	Aki	Tosa	Shikoku	1
L14690 k	near Takanji	Mikara	Awaji	Awaji	1
I2369 a	Yosoo	Kariha	Echigo	Nippon	1
I2407 ra	Koshimidzu, Shizone.	"	"	"	1
I2407 qa	"	"	"	"	1
I2424 ya	Okada	"	"	"	2
I2392 h	Miyadaira	"	"	"	2
L1131 u	Horumui River	Sorachi	Ishcari	Yesso	2
L1570 h	Oraski	Tomamai	Tesrio	"	3
L1583 s	Herashioto River	Kurumappe	"	"	1
M1555 la	Makumbetsu	Shidzunai	Hidaka	"	1
M1687 va	"	"	"	"	2
T826 a	"	"	"	"	1
T866 k	"	"	"	"	2
T869 g	"	"	"	"	1
T874 e	"	"	"	"	1
T874 g	"	"	"	"	1
Z661 i	"	"	"	"	1
Z661 j	"	"	"	"	1

Shikohu, where as there would appear to be not a single ton of workable coal in the whole island. Too implicit faith in such heedless exaggerations might encourage over sanguine, ignorant men to waste enormous sums of money, and thereby might do immense harm.

Thence the road went southeasterly along the sea shore five leagues and a half to Morotsu Utility at first and occasionally afterwards over a narrow flat, but often over the foot and sides of high hills on our left; with many exposures of Kamoikotan hard metamorphic grit, dark brown males, and dark brown quartzite; and the dips were, for example, 30° south 30° east, and at a saddle in the rocks 20° north 50° west and 70° south 40° east, and in another place 60° south 20° east. Then going northeasterly up a narrow valley and across a pass about 650 feet high, with some exposures of the brown Kamoikotan males; we descended in two leagues to Shiina on the southeasterly sea shore of Shikohu, having cut across the southern

[illegible] talc schist dipping 20° north 10° west.
The Branch Prefecture office at Tokushima showed us specimens of the rocks and minerals of Awa. There was copper pyrites fine grained, apparently like all the copper ore of Nikoku, and generally impure with iron pyrites and associated with talc schist from four places in Ovogori, two in Mimagori, two in Miyoshigori one in Nagagori, [illegible] in Kaifugori and one in Miyoosai-gori; traces of black shiney coal from two places in Katsuuragori and one in Nagagori; traces of stibnite from Nakamura in Kaifugori, where there was a mine; [illegible] metamorphic limestone from four places in Nagagori and two in Katsuura-gori, talc schist from three places in Mima-gori, one in Miyoshigori and one in Miyootoogori, dark chocolate, brownish black, greyish black or black, apparently Kamoikotan shales from two places in Naga-gori, two in Katsuuragori, one in Kaifu-gori; and plasma from Ovo village in Nagagori. None of the copper mines

The Prefecture at Wakayama showed us specimens of ores and rocks from different parts of the province of Kii. There was fine grained copper pyrites, generally impure with iron pyrites and sometimes associated with talc schist from four places in Stagoori, all worked a little, two since 1874, one since 1875, and one, the best, at Maruyama, in some village, since 1863 or 1864; also from two villages in Nagagoori, one with a small mine since 1873 and the other without any; from one place in Hidakagoori, worked from 1876 to 1878 and abandoned; and two in Nagasagoori, both abandoned. There was black shining coal, partly bituminous and good looking, partly anthracite and rather impure with slate from three places near together (perhaps half a league apart) in Minogoori, where the bed is said at one place at least to be three feet thick. There was silicate from one place in Hidakagoori, said to be 0.6 ft. wide and to have been discovered in 1870 and mined in 1878 to a length of five fathoms, with five holes.

was given me roughly by the miners as follows, from above downwards:

	Feet
Hard [sand] rock	
Soft greenish gray shales, about	0.50
Slate or black marl ("giche")	0.70
"Soft coal," about	0.40
Slate	0.40
"Good coal," about	0.75
Slate	0.40
"Good coal," about	0.75
Slate	0.40
"Good coal," about	0.75
Hard [sand] rock	
	5.05;

but in all, from the upper coal layer to the bottom, 2.7 ft. or 2.8 ft., including the slate, sometimes 3.0 ft., sometimes only 2.0 ft. At about 15 fathoms from the mouth of the adit I measured the coal 3.75 ft. thick including the slates; and that was a thick place. The upper layer of coal there is about 0.8 ft. thick and the bottom one 0.2 ft.; the upper slate is about [illegible] ft., and the two others [illegible] (one of them concealed by timbering). [illegible]

layers of coal are thick the lower one is thin to correspond. Perhaps the whole thickness of the better coal may be taken in general as a foot and a half or including the upper soft coal about two feet. The coal bed is said to be visible half a mile (about ten chains) distant to the south on the other side of the hill, and also a furlong or two to the southwest. The coal is black and shining.

The first mining done here was from the second to the ninth month in 1875 or 1876: but it did not pay and was abandoned. In May, 1878, it was taken up again. The mine is a very low adit about 15 fathoms long, with about twenty fathoms of old abandoned working beyond that. There is mining to a depth of about 15 fathoms below the adit, and to a height of about 17 fathoms above, to the surface of the ground. There is a set of three bamboo pumps, each four fathoms long. It is said that at times as many as thirty men are at work digging coal. From May, 1878, to the end of the year about 600 piculs of coal were [illegible]

away; and it sold at Oosaka, they say, for $25 or $26 a hundred piculs (say $4.50 a ton). It is carried by hand carts to Ise, five leagues and a half, for seven cents a picul (or bag); and from Ise to Oosaka by junk for $8 a hundred piculs. There would seem then to be a chance for a little profit, in spite of the thinness of the bed and its poor quality. It would be best to make a geological and topographical survey of the whole place, and [illegible] whether the bed could not be worked for a considerable time without pumping, and whether there is enough to justify a tramway to Ise. Even carrying in horse wagons, if the short distance from the mine to the main road at Kusuwara were made passable, would save a large part of the seven dollars a hundred piculs now lost. There is said to be a coal mine now idle, not far off, near Hine, in Oomi.

Returning to the good, main road we followed it still southeasterly to Ise, at first descending a little rapidly for several hundred yards, and then by despair very gently,

Report on Information Obtained through Messrs. Kuwada and Nishiyama, Assistant Geologists, by Benjamin Smith Lyman.

To His Excellency K. Inoue.
Public Works Minister.

Sir:

I beg to report as follows the substance of certain information lately communicated to me by Messrs. T. Kuwada and S. Nishiyama, Assistant Geologists, and chiefly based on observations made by them in 1878.

Kusakura Copper Mines.— The Kusakura copper mines are in Kanose village, Kamoaragoori, Echigo, now a part of Fukushima Ken; and are about two leagues and a half northeast of Tsugawa, and about a league and a half from the Aka River.

The rocks of the neighborhood according to specimens brought back and shown to me are of the Kamoikotan series and are mainly white or light gray or pale green oligoclase quartz porphyry containing sometimes minute grains and crystals of pyrite and chalcopyrite; but

in some places (not as country rock) there is a metamorphic mud pebble rock of gray and black quartzite pebbles in a brown weathering grit, and in others gray shales (not shown me) are exposed like those of the small coal field of Abadani near, and doubtless of the same age. There are said to be two mines, but only one is worked. The strike of that one is north and south with a dip about vertical. The width of ore as stated to me at Tengawa was about 0.25 ft; but at the best points observed by Messrs. Kuwada and Nishiyama it was 0.5 (on level No. 4 of the Sankakukoo mine); 1.0 ft. (in level No. 5); 1.2 ft. (in level No. 6); and on level No. 7 0.5 ft. on one side of a horse perhaps a couple of fathoms across and 0.3 ft. on the other side. They ~~greatest~~ were told that the greatest width was 1.5 ft. The ore is copper pyrites associated with pyrite and with quartz gangue; and is said to yield, probably when carefully washed 20 or 30 percent of copper. The country rock is light gray hard [illegible] quartz porphyry, that contains a few minute flecks of copper pyrites.

The mines were first begun in the [illegible]

period (1726—40); were worked by the Prince of Nidzu until ten years ago; after that by the Wakamatsu hen; but since 1875 had been owned and worked by Mr. Furukawa a merchant of Gede. They told me at Tsugawa that there were 19 mines; but Messrs. Kuwada and Nishiyama found but four still worked, and a fifth (probably the Oojiri) a new mine that had not yet reached the vein. The Tanhahu hoo called also the No. 21 mine (the mine one they entered) is 500 feet long, and 170 ft. deep from top to bottom, and for the [illegible] has been worked out. At least one of the other three mines is on the other side of the mountain, a league or so distant by road. There is no pumping, and the water is said to drain away into crevices in the rock without any deep drainage level. At Tsugawa, they told me, they were digging a new low drainage level called the Oojiri with two hour shifts, and that it was soon to be finished. The rock is so firm that apparently no timbering at all was used. The drifts were very narrow indeed, in the

old style, and the ore was carried out on the backs of boys, sometimes with serious accidents where very narrow, vertical shafts have to be climbed up and down by means of rude ladders or rather stairways made of steps cut roughly in a small inclined log of wood according to the usual custom of Japanese mines. Powder, however, is now used for blasting. The lighting is done with oil in Japanese made lamps arranged somewhat like the French mine lamps, but smaller.

The ore is broken up by hand and washed in the ordinary Japanese methods. The ore is then roasted in iron pots holding 300 hamme of ore, and 1½ tana of wood (one tana there is probably 5×6×2 ft). There are 75 such pots. The men who have charge of the roasting are said to suffer much from the sulphurous smoke, and to be in consequence very short lived. The roasted ore is smelted to blister copper (arado) in two hearths; and the charge for each is 100 hamme of roasted ore and 150 hamme of charcoal. The blister copper is sent to Yedo on horse back. The charcoal

is brought to the furnaces on the backs of men from the mountain and from across the mountain, a league in all directions and it is expected that in five years it will become very scarce.

According to returns made to the Government Mining Office for December, 1876, the ore on hand at the beginning of the month was 11210 hamme, the ore mined during the month was 8890.25 hamme, the ore smelted during the month was 10457.73 hamme, and the ore left on hand at the end of the month was 9642.52 hamme; and in the same month the blister copper produced was 2981.1 hamme (or 187½ piculs), which was sold for $3312⅓ (or $17.66½ a picul); and the number of working days was 31 in the mines, and 31 at the furnaces; and the number of days' work was 3604 for the mining (probably including the washing), and 623.4 for the smelting, or 4227.4 days' work (making the number of workers average 116¼ for the mining and 19¾ for the smelting, or 136 in all); and the expenses were $1482.58 for the mining and $420.92 for the smelting, or $1903.50 in all; besides a tax

of $4.347. According to statements made at the mines the average monthly production of washed ore at the time of the visit (4 Sept. 1878) was 6500 hammer; and in 1876 the whole yield was 1496 piculs, worth (at Vedo) $26928; in 1877 it was 1730 piculs, worth $31.140; in the first half of 1878 it was 860 piculs worth $15480. There were at the time of the visit in all 183 workers, namely: 50 miners in the new mine; 38 miners in the four old mines, 25 boys (from 12 to 16 years old) for carrying ore, 40 men for reasting the ore; 10 smelters men, 30 men for powdering and washing the ore. There must be some in the office besides. At Gurugwa they told me that the whole number of workers, including the charcoal burners, was about 500.

The wood costs sixty cents a tana, and the charcoal 25 cents for 10 hammer. The washed ore is reckoned to be worth $8.37½ the 100 hammer, and the cost of smelting 300 hammer of it is said to be $11.61; it probably these are the rates reckoned in the accounts between the mining owner and the miners wholesale portions of

the mine. The carriage of the blister copper to Yedo costs 90 cents a picul. The wages of the workmen are 12 cents a day and 7 goo of white rice (worth probably six cents) and 40 me of miso (worth probably three quarters of a cent, making the whole pay 18¾ cents); and the women and boys have about one half as much. For example, for powdering one shoo of ore the pay is $0.001, or for one too, about a day's work, six cents. For mining five feet in length by four in height and two feet in width from eight to thirty dollars are paid. The blister copper is said to sell at Yedo for about $18 a picul.

They said at Kusakura that the mines were at present yielding a pretty good profit, though a great outlay was needed for improvements and in five years fuel would become very scarce. The profit however is said to come in great part from the mine owner's store, where the necessaries and comforts of life are sold to the working men. The owner however wishes to sell the mines and therefore is probably disposed to make them

appear quite as profitable as they are; and he complains particularly of a lack of capital. According to the returns to the Mining Office the yield of blister copper in Dec. 1876 was 28½ per cent. of the ore smelted, a highly improbable result, since pure copper pyrites contains only 34 6/10 percent. of copper and the yield at other Japanese mines with like ore and like methods is only about twelve or fourteen percent. of the washed ore. The statement that 6300 hammer of washed ore was produced at present monthly, would give the wholly impossible yield of 35¼ percent., unless in smelting more ore was added from the reserves, which, however, would seem likely by this time to have been exhausted since Dec. 1876, so the high rate they were then drawn upon. In any case the monthly yield of ore since that month would seem to have diminished by over one fourth, while the yield of copper has increased by about one fourth, though very constant through 1877 and 1878. It is clear that there are some gross errors in the statements and it would appear that the yield

of copper was overrated; for with two hearths only and a daily charge of 100 hamme for each, the amount of ore smelted monthly, even without any days of rest, would be only about 6000 hamme. Moreover 36 women who powder the ore, even allowing for no days of rest, would at one loo, or half a ounce, or say 92 lbs, a day each, prepare in all only 10000 hamme a month; and it must be very safe to reckon that the whole product is really not two thirds of that. Supposing a monthly consumption of ore to be 6500 hamme, and the yield of it to be about 12½ percent, there would be about 800 hamme or 50 piculs of copper produced monthly, worth, at eighteen dollars a picul, $900; or in a year $10800. The fuel for the same ore at half a tana of wood and 150 hamme of charcoal for every 100 hamme of ore would amount to $350 a year, and the carriage of the copper to market would cost $540; the cost of the oil and powder and tools used in the mines, which would amount probably, as at other mines (namely powder 80 cents, (to about two dollars a month) one moo of oil 35 cents, tools say 70 cents) for each miners (neglecting the carriers) or say

$176 for them all, or $2112 a year leaving not more than $5000 as the yearly product (or $416⅔ monthly) of the labor of the 183 workers, or $27.32 a piece, or $2.27½ a month. Again if the monthly product of one was in Sept. 1876 less than three fourths what it was in Dec. 1876 and the number of smelters and of miners in the Oxgai were the same, but the other workers less in the same proportion, then the reported number of days' work in 1876 would show that in the mining workers were being on the average just two thirds the whole number of days and in the roasting and smelting one half. At those rates the 40 roasters and smelters and 43 others at the remarkably low wages stated would earn over $545 a month, or $297 a piece, or all together about $6350 a year; and something has yet to be added for those who work in the office (probably four or five men) with pay of say $40 a month making the whole amount perhaps $7030. Moreover something should be reckoned for various incidental expenses, for deterioration of building and other property, to say nothing of interest on capital. But that amount is already more than the

with working at all, no doubt it would be highly desirable to build such a road.

Akadani Coal Field.— Messrs. Kawada and Shibayama spent three or four days at the beginning of September, 1876, in making a rough survey of the Akadani coal field in Kamboro Gori, Ichigo, about two thirds of a league south of a village of the same name and [illegible] leagues southeast of Shibata. They had also in 1876 made a little away inside the Municipal mine Tore, Kawadoriyama, which however in 1877 and 1878 was broken down and could not be entered. The coal is exposed at about ten places within a length of about two thirds of a mile, with a thickness from 12 ft. to 10 feet that of very bad quality at the thicker places, bedded mainly between light gray shales and clay, but in one place resting immediately on granite, and in one with a dike of 13 separated from the granite below by half a foot of shales and with 7 ft. [illegible] above and two feet of coal above that, [illegible] gray shales again and the dike [illegible] of 13 [illegible]

The number of beds has not yet been studied out; but may be three or four, possibly more.

[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]

Niigata [illegible] 30 cents a picul. The net profit allowing for the cost of the miners' food, oil and tools, for office and incidental expenses, is five cents a picul, or about $500 a year.

It is evident that with a wagon road from the mines or with navigable water a greater part of the way the profit would be much more.

Fudoodaki and Unodaira Coal.— On the fifth of September, 1878 the two assistants visited the Fudoodaki coal exposure a mile (15 chos) northeast of Kiyokawa, a village on the bank of the Aka River about a third of a league below Tsugawa; and likewise visited the Unodaira coal exposure 500 to 600 yards [illegible] of Fudoodaki. The Fudoodaki coal [illegible] to be only 0.2 ft. or 0.3 ft. in thickness, [illegible] between the gray shales and hard rock [illegible] a dip of 20° north 70° east. The [illegible] was of about the same thickness, and appeared to be the same bed with a section that corresponded well; and it dipped 20° north 70° east. Both places are [illegible] unworkable.

Kusodzu Oil. Catheta of September, 1878.

they visited the Kusoodyu oil exposures on the northern bank of the Aka River, 500 to 600 yards west of the village of that name, about four leagues and a half below Tsuyama; but there was only a trace of oil in the gravel. At Waturite, about 600 yards north of Kurasugi, a village about three leagues northeasterly from Kusoodyu they were shown some fossil fishes in the gray males.

Hot springs in Shimotsuke, Iwashiro, Uzen and Ugo.— Messrs. Kuwada and Sishiyama have also recently prepared lately the following table and notes in regard to hot springs visited by them in 1877 in the provinces of Shimotsuke, Iwashiro, Uzen and Ugo:

Table of 24 Hot Springs

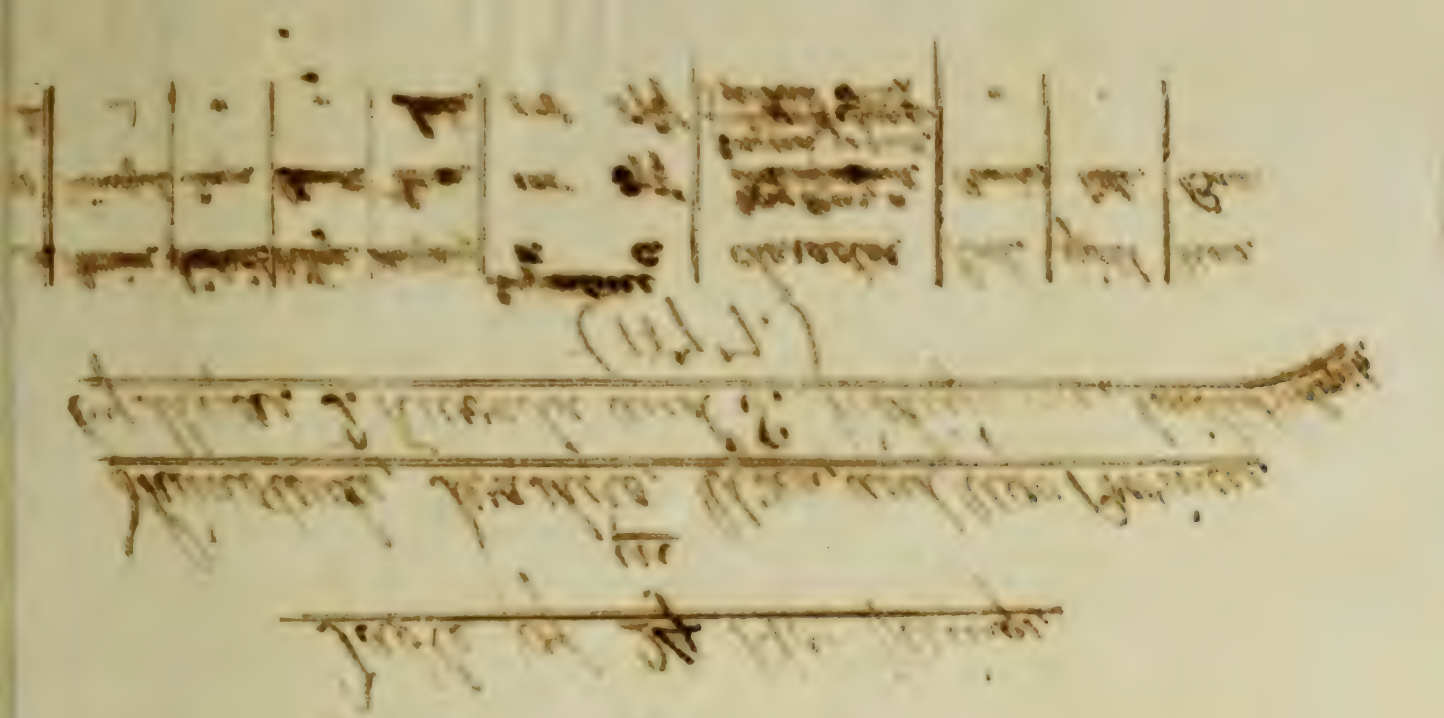
in

Shimotsuke, Iwashiro, Uzen and Ugo Provinces

by Messrs. T. Kuwada and S. Sishiyama, Assistant Geologists

(1877.)

	Province	District	Village	Hot Spring	Temperature F.	Temperature C.	Character	Rock	Yield	Uses
1	[illegible]	[illegible]	[illegible]	[illegible]	100°	37.7°	[illegible]	[illegible]	[illegible]	[illegible]
2	"	"	"	[illegible]	100°	37.7°	[illegible]	"		



No.	Province	District	Village	Hot spring.	Temperature F.	Temperature C.	Character.	Rock.	Uses.	Time.
3	Shinshū	Suwa	Yamato	Yado	100°	37 7/9°	Slightly salty, not much smell.	Pumice?	Bath	
4	"	"	"	Sasa	130°	54 4/9°	Bitter, clear; no smell.	"	"	
5	"	"	"	Yoda	140°	60°	Clear; not salty; not much smell.	"	"	
6	"	"	"	Uba	133°	56 1/9°	"	"	"	
7	"	"	"	Jōzai	152°	66 2/3°	A little sour; clear.	"	Bath	
8	"	"	"	Kawara	135°	57 2/9°	Sour; clear; sulphur smell.	Volcanic rock?	Bath and drink	
9	"	"	"	Hadaka	137°	58 1/3°	"	"	"	
10	"	Shinano	Kawaji	Kawaji	110°	43 1/3°	Not salty; not much smell; clear.	"	"	Bath and drink
11	Iwashiro	Aizu	Higashiyama	Yamato	110°	43 1/3°	"	"	Bath	
12	"	Yama	Okuda		100°	37 7/9°	Very salty; no smell; clear.	" ?	1000 tubs a day	For salt
13	"	"	"		102°	38 8/9°	"	" ?	"	"
14	"	Shioda	Sizaka	Yado	135°	57 2/9°	Not salty; clear.	"	Bath	
15	"	"	"	Hako	130°	54 4/9°	"	"	"	
16	"	"	"	Yoda	125°	51 2/3°	"	"	"	
17	"	"	"	Ko.	105°	40 5/9°	"	"	"	
18	"	Date.	Yamamura	Yado	114°	45 5/9°	Not salty; clear; sulphur smell.	"	"	
19	"	"	"	Kiri	110°	43 1/3°	Not salty; clear.	"	"	
20	"	"	"	Nitsuma	104°	40°	"	"	"	
21	Uzen	Nitsuma	Akiyu	Onyu	136°	57 7/9°	Slightly sulphur smell; salt, and sour.	"	Bath and drink	
22	"	Motoyama	Kamimo-yama		140°	60°	Very clear; tastes of salt?	"	Bath	
23	Uzen	Akita	Oyasima		118°	47 7/9°	Very salty; bitter; smell yellow.	"	Bath and drink	
24	"	"	Hinomori		cold		Salt, slightly.	Sandstone	3 tubs a day.	

No.	Province	District	Village	Division	Inclination F.	Inclination G.	Character	Rock	Water	Issues
3	[illegible]	[illegible]	[illegible]	[illegible]	100°	37 2/9°	[illegible]	[illegible]	[illegible]	
4	"	"	"	[illegible]	130°	34 4/9°	[illegible]	"	"	
5	"	"	"	[illegible]	140°	60°	[illegible]	"	"	
6	"	"	"	[illegible]	133°	36 1/9°	"	"	"	
7	"	"	"	[illegible]	152°	66 2/3°	[illegible]	"	[illegible]	
8	"	"	"	[illegible]	135°	57 2/9°	[illegible]	[illegible]	[illegible]	
9	"	"	"	[illegible]	137°	58 1/3°	"	"	"	
10	"	[illegible]	[illegible]	[illegible]	110°	43 1/3°	[illegible]	"	"	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	110°	43 1/3°	"	"	[illegible]	
12	"	[illegible]	[illegible]		100°	37 2/9°	[illegible]	" ??	[illegible]	[illegible]
13	"	"	"		102°	39 4/9°	"	" ??	"	"
14	"	[illegible]	[illegible]	[illegible]	135°	57 2/9°	[illegible]	"	[illegible]	
15	"	"	"	[illegible]	130°	54 4/9°	"	"	"	
16	"	"	"	[illegible]	125°	51 2/3°	"	"	"	
17	"	"	"	[illegible]	105°	40 5/9°	"	"	"	
18	"	[illegible]	[illegible]	[illegible]	114°	45 5/9°	[illegible]	"	"	
19	"	"	"	[illegible]	110°	43 1/3°	[illegible]	"	"	
20	"	"	"	[illegible]	104°	40°	"	"	"	
21	[illegible]	[illegible]	[illegible]	[illegible]	136°	57 2/9°	[illegible]	"	[illegible]	
22	"	[illegible]	[illegible]		140°	60°	[illegible]	"	[illegible]	
23	[illegible]	[illegible]	[illegible]		115°	47 2/9°	[illegible]	"	[illegible]	
24	"	"	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	

Remarks on the Foregoing Hot Springs, by Messrs. Kuwada and Nishiyama.— "Nos 1–9.— About six leagues west northwest of Nikkoo, and about three leagues west of Lake Chiuzaiji; within a length of 120 yards. All issue from very recent looking pumice. No 7 boils up through a hole 1½ yards square in great quantity. The springs are said to be good for diseases of the loins. We were told that about fifteen years ago Mount Shirane, about two leagues distant, had an eruption and flowered down much pumice on the surrounding country.

"No 10.— On the right side of Ikarigawa, opposite to Takahara. Said to be good for wounds.

"No 11.— On both sides of Yugawa, in Higashiyama, about a league east of Wakamatsu. [See also page 26]

"Nos 12–13.— On the right side of the stream near the road in Ooshio village, about 5½ leagues northnortheast of Wakamatsu. From this mineral water common salt was made. [See also p. 29.]

"Nos 14–20.— On both sides of Suwakamigawa, which is about 200 feet wide, between Sizaka and Yunomura, three leagues northwest of Fukushima.

Remarks on the Progress Not Phrasing, by Ellipses, Kuwada and Nihiyama. — No. 1-9. — About six leagues west-northwest of Nikko, and about three leagues west of Lake Chiuzenji; within a length of 120 yards. All cinder from very recent Cooking furnace. No. 7 boils up through a hole 1½ yards square in great quantity. The phrasing are said to be good for diseases of the Crins. We were told that about fifteen years ago Mount Niane, about two leagues distant, had an eruption and showered down much furnace on the surrounding country.

No. 10. — On the right side of Nanjawa, opposite to Sakalara. Said to be good for rounds.

No. 11. — On both sides of Yugawa, in Nigashiyama, about a league east of Kakamatsu. [See also page 24]

No. 12-13. — On the right side of the Nikko near the road in Cooking village about 5½ leagues northwest of Kakamatsu. From this Mineral water common was was made. [See also p. 29.]

No. 14-20. — On both sides of Sumkamiyama, which is about 200 feet wide, between Sigala and Nunomura, three leagues northwest of Fukushima.

said to be good for scaldings and wounds. A suspension bridge here adds much to the scenery.

"No. 21. — Ahaya village is about five leagues northeast of Yonozawa.

"No. 22. — Kaminoyama is a small town about three leagues south of Yamagata.

"No. 23. — Yunomura is about 1200 yards west of Kitanoura on the northern coast of Ogashima. The water is said to be good for eyediseases and wounds.

"No. 24. — On the side of the stream near Horinouchi, about a league east of Ookubo."

I have the honor to be

Sir

Your most obedient servant

Kooji Machi, 9 Sept. 1879

Benj. Smith Lyman

and at length traveling a very wide alluvial plain. The Prefecture there showed us a number of specimens of the rocks and minerals of Ise, Iga, Shima and the small part of Kii that is under its government. There was copper pyrites (fine grained and apparently mixed with iron pyrites, and in one case associated with magnetic pyrites) from four places in Ishidzure village, Inabegoori, Ise; and from three places (two of them coarse grained, with talc) in Yoojikawa village, Murogoori, Kii; and there were traces of malachite from three places in Ishidzure. There were traces of galena (mostly fine grained, and associated sometimes with talc, quartz or magnetic pyrites) from six places in Ishidzure, and from one in Yamadagoori, Iga. There was black shining coal from the Hagiwara mines (above mentioned); and dull black coal from Kasuwara near them; black and shining coal from Koobeyama, Nhaigoori, Iga; dull black bony coal from Shimagahara, Nhaigoori; and it was said that the Kii anthracite, already spoken of at Wakayama, extended across the line into Murogoori in the part of the province governed from Ise. There was magnetic iron

sand from Adashika village in Murogoori, and from Nabarigoori, in Iga. There was gray Kamoikotan limestone from Ise: four places in Watarai goori, two in Inabegoori, one in Iitakagoori, from two in Murogoori, Kii; and from one in Ahaigoori, Iga; and there was concretionary limestone, probably of later age, from three places in Ishidzure, and two in Iitakagoori. There was talc or steatite from one place in Ichishigoori, Ise; one in Inabegoori, Ise; one in Nabarigoori, Iga; three in Igagoori, Iga; and serpentine from one place in Tooshigoori, Shima. There was mica schist from one place in Kuwanagoori. There was granite from one place in Ichigoori; one in Iitakagoori; one in Miegoori, Ise; one in Inabegoori; four in Nabarigoori; There was fossil wood (called "Umoregi", and similar to wood so named near Sendai) from Ishidzure; and there was a little pale green and greenish brown and white fluor spar from Ishigureminami village in Inabegoori. There were blackish hard Kamoikotan shales from three places in Inabegoori, and from one in Ishishigoori. There were also many specimens of tile clay, wall

plastering clay, sands for sprinkling on wall plaster, mica for wall paper, grayish kaolin, and terra cotta earth (particularly used for the famous Kuwana terra cotta, called "Banko" from the name of the original maker). The principal mine within the limits of the Prefecture is a copper mine at Yoojikawa, Shirogoori, Kii; and its is said to have been worked from the Hooreki period (1751-63), to have been abandoned about 1852; and then worked again since 1872. Inabegoori is reckoned the richest district of Ise in useful minerals; and at Ishidgure there was a mine worked under lease for silver and lead from the Tenshoo period (1573-91); often abandoned and taken up again; and now worked since about 1876.

From Tsu we travelled northward ~~xxxxx~~ twelve leagues and a half near the sea shore, through Yokkaichi (where we rejoined the Tookaidoo) to Kuwana. The road lay wholly in a very wide alluvial plain; but near Kuwana we passed some low hills, perhaps 100 feet high, near by on our left, apparently made up of greenish

gray shales like those of the Toshibets Group. At Kuwana they told us that the clay for Banko ware or terra cotta came from those hills just south of the town; that the ware was first made by Banko about fifty years ago, who was succeeded by Yusetsu; and that there are now three houses that make it there, with three or four kilns. Some of the pieces are very ornamental; and some extremely thin, so as to be translucent.

We went by river boat northerly two leagues to Maegasu; and thence seven leagues easterly through a very wide alluvial plain, near the sea shore at the northern end of the Ise Gulf, across several streams, to Nagoya, in Owari. The Prefecture there showed us a few mineral and rock specimens from Owari and Mikawa: and information was given about the potteries, the principal industry connected with minerals, both porcelain (setomono or ishiyaki) and terra cotta or rough pottery (tsuchiyaki). There are ninety houses that make porcelain in Seto village, in Kasugaiyoori, Owari five and a half leagues northeast of Nagoya, the village that began

manufacture about a hundred years ago and has given it name to a [illegible] throughout the northeastern part of Japan; and fifty houses that make tsuchiyaki, which was begun there 600 or 700 years ago; and there are others that make porcelain at Akadzu, a short league east of Seto, and some at Shimoshinano and Midzuno. But these smaller places learned the art later from Seto, and their tsuchiyaki kilns are more numerous than the ishiyaki ones. They produce at Seto $120 000 to $150000 worth yearly. The Seto porcelain is also called somesuke from its blue color. The blue was produced by earthy cobalt that covered the pebbles of quartz in a grayish black pebble rock or grit found at Seto. The stone was first roasted, and thereby fell readily to powder. It was then put with water into a mortar, and rubbed so as to separate the cobalt from the pebbles and sand, which fell to the bottom. The muddy water was poured off, and the [illegible] cobalt, now of a [illegible] cour, settled to the bottom, and the water was poured off. [illegible] product the [illegible]

times. It was used for coloring porcelain in that state and turned blue in baking. The sea pebble rock with [illegible] cobalt is no longer found, but one is found with [illegible] pebbles containing a little cobalt. The digging and preparing now costs more than the product is worth and so foreign cobalt called "Egusuri" or "Kinagosu" is generally used. The best quality of the stone for porcelain used at Seto comes from Sanage village, in Kamogoori, Mikawa three or four leagues southeast of Seto. A specimen shown was a white, hard, undecomposed, triclinic felspar without any visible quartz. But sometimes very dark smoky quartz crystals occur in it up to 0.1 ft. in diameter, and a specimen was shown about 0.15 ft. in diameter. The stone is reduced to powder with a water wheel, washed twice at Sanage and about twice more at Seto; but for rather rough ware they wash it less than for the fine. Some of the Seto porcelain is made from a light gray stone found there and at Akadzu and all through the region. It appears to be an [illegible] quartzose [illegible] [illegible] [illegible]

coarse sandstone, rather loosely coherent and made up of gray quartz grains covered with a white powder of decomposed feldspar. It is pounded up fine by hand and washed; the sand falls to the bottom and the muddy water is drawn off and allowed to settle successively in three tubs arranged in step form, and in the third the sand is wash and the settled mud purest, and [illegible] is used. The first of the three is the best for strength, and the last of them is the plastic indeed. The three products however are mixed in the proportion of one part of each of the two former and two parts of the last; but the proportions are a little different at different houses and according to the size of the articles, large or small. The first of the three is also used sometimes for glaze, mixed half and half with the [illegible] to be mentioned (or the next but one), which is however used in larger proportion or alone for glazing inferior articles. From Toogolum in Kamishidami village there was a nearly pure snow white hard quartz, porphyry, made up of glassy colorless quartz and snow white feldspar (perhaps mixed with quartz

good success for
[illegible] Mon Chenge, [illegible] was
[illegible] mainly cultivated & [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible]

1875 it began to be applied to porcelain. The principal manufacturers at present, the Shippoo Company of Nagoya, first began work in 1872, and now employ thirty men. Mr. Hara Fujii also has an establishment at Nagoya for such work, where about ten men are employed, and ornaments porcelain only. The outlines of the design are marked out upon the surface of the unglazed Seto porcelain by little strips of thin, narrow brass ribbon or flat wire (about two ft. thick), cut to the right length, bent to the proper shape set edgewise and held by a paste called "bankunia." A little glazing is then put on, and the piece is baked about eight hours in a small furnace of some [illegible] ft. in diameter and three or four feet in height, like those described in the report for 1878 as in use for the Satsuma porcelain. Then still more glazing is put on, and the piece is baked again, the same as before; and so with more glazing it undergoes a third baking. By this time the brass ribbon is covered up, and the whole is polished down by hand with whetstones until the edge of the ribbon comes just to the surface, and looks like a

golden wire. [illegible] instead of the brass a very little silver wire is used. The brass does not very noticeably tarnish in a number of months at least; but perhaps a still better effect might be produced at small expense by electro-gilding or electro-plating with silver the edge of the wire (or with both gold and silver in different parts of the design). The polishing down the glaze takes a great deal of time and manual labor, which might perhaps be saved in great part by water power, if whetstone wheels were used. In polishing defects sometimes occur from the chipping off of small portions of the glaze; but such blemishes are concealed by way of a suitable color. The different portions of the design are filled with glaze of different colors; but the cobalt blue has hitherto been the most usual color, though now several other pleasing ones are coming very much into use.

We were also shown a specimen of fine grained copper pyrites mixed apparently with iron pyrites, and associated with a little galena in fine grains, from Ooro village in Shinagori

Milan 2.

apparently some brown hamilton dairs. Sea Sulagawa (half a league further on) we turned to the left from the Tootoomi, and going north-easterly two leagues over gently rising ground, and passing near one exposure apparently of brown weathered gray quartzite, we descended abruptly past numerous exposures of level brown, gray, [illegible] brown gravel and earth beds to things on the shore of the Hamana Lake, in the south western corner of Tootoomi, a bay nearly shut out from the sea by sand bars. Thence we crossed by boat five leagues and a half easterly to Hamamatsu, the last league or so through a narrow river or canal, with here and there low hills not far off to the left with exposures of greenish gray and brown shales like those of the Toshibets Group. Thence the road (the Tokaido again) ran easterly through a wide alluvial plain, and across the large Tenrin River, and at Mahaidzumi (nearly four leagues from Hamamatsu) ascending to rather higher ground passed an exposure of level bedded first size gravel of fine grained gray granitic pebbles and again in another [illegible] beyond Mitsuke,

and is by a larger hill [illegible] on the descending [illegible] [illegible] and the second [illegible] [illegible] [illegible]

containing trichinic feldspar (probably oligoclase), augite, magnetite and sometimes pyrite; doubtless very durable, but difficult to cut and sombre looking; and the other half are tufas apparently likewise andesitic and containing magnetite and sometimes pyrites; mostly light gray or light brown and comparatively soft, possibly in some cases rather too soft for strength. Of nine specimens of the andesites, from Suruga Province, four come from Abegoori, three from Suntoogoori, and one from Masudzugoori, and one very vesicular andesite or lava, from near Mount Fuji in Fujigoori; and three from Idzu Province all come from Kamogoori. Of seven specimens of the tufas from Suruga five come from Suntoogoori (three light gray and one light brown), and two from Shidagoori; and of four from Idzu three come from Kimizawagoori (two of them light brown and light gray) and one from Kamogoori (light gray). Such building stone may be of great importance not only to the towns of those provinces, but even here in the capital, if the quarries are not so inaccessible that carriage to the sea shore would be too costly.

There is also a very easily worked greenish gray sandstones like what is found in the Tokiboto Group of Yezo, that comes from Sanogoori in Tootoomi; but perhaps it would generally be rather too soft for building purposes, though the specimen is pretty fine. There is a piece of dark brown serpentine, and there is one of dark greenish gray Hematite from Toyodagoori, Tootoomi; and one of Kumwikotan clay slate from Abegoori, Suruga. There is a little kaolin, and there is a little sulphur impregnating a light brown tufa (apparently andesitic) from Kamogoori, Sitsu. There are specimens of copper pyrites associated with pyrite and talc schist from three places in Toyodagoori, Tootoomi, all but one of them very low-looking, and traces of copper pyrites with pyrite and quartz from Fujigoori, in Suruga. There are specimens of gold quartz with the gold partly visible from Bono in Kamogoori; and with the gold scarcely visible from two other places in Kamogoori and one from Abegoori.

From Kidonoka we came very rapidly home by the Tookaidoo, passing once more the rather few roadside rock exposures seen in

1877 and 1878. In the bed of the brook just west of Yokosuna village the pebbles were dark brownish gray, apparently Kamoikotan quartzite; and in the brook just east of that village there were like pebbles, but larger, fist size, with the addition of some light gray apparently granitic ones. The pebbles of the stream at the big bridge just east of Okitsu were mostly light gray fine grained granitic ones of head size. In the cliffs just east of that was exposed pudding rock, partly of granitic and other Kamoikotan pebbles, but interbedded apparently with Old Volcanic andesite and tufas; and a few hundred yards still further east, near Kanaoka, there was at the roadside dark brown andesite containing triclinic feldspar (probably oligoclase), augite and magnetite in a rather coarse grained matrix of apparently similar materials. Just east of Numadzu there was exposed some dark brown (weathered doubtless from greenish gray), pebbly tufa level bedded; and at the beginning of the ascent of the Hakone mountain some level greenish gray soft tufa like the beds near Yokohama and probably of nearly the same age

At the first hill east of Hakone Lake there was an exposure of gray, slightly vesicular andesite, containing glassy triclinic feldspar (probably oligoclase), magnetite and augite in a vesicular light gray matrix; and at the first roadside quarry below Sumoto on the way to Sunmaiba-shi a very light gray andesite tufa containing glassy triclinic feldspar (probably oligoclase), magnetite and augite in a light gray fine grained matrix, apparently of decomposing pumice. At Odawara there were some more exposures of greenish gray vesicular Volcanic rock, and for a couple of leagues short of Ooiso there were a few exposures of the greenish gray, tufaceous sand rock sometimes with fish-rice, probably.

After arrival here (3 Feb. 1879) my time was spent in report writing, in helping at the geological mapping and at other office work, particularly in writing up the report of progress for 1878, which was however interrupted near the beginning for the preparation of some rough notes (one third as much as that report in amount) on mines and furnaces in the Central Provinces, for the use of Messrs Hannes and

Olori on their journey. After the first of May the work was done a little more leisurely, since by agreement of the outset I was to have [illegible] months of holidays at any convenient time, and only so much remained of my [illegible]. Although the work was still too hurried it was less so than in the case of former reports, which have only been written while travelling, or yet more hastily at home, and a little time was taken to look at rock specimens, which had formerly been neglected in favor of matters of more pressing importance. I hope before long to examine in the same way the rock specimens we gathered in Yesso, and to correct errors that doubtless occurred in record to them while in the field, and perhaps make in consequence some changes in the limits of the old Volcanic and Kamoikotan rocks on the colored geological sketch map of the Island.

The assistants worked busily upon their maps of the oil surveys, having before my return begun the redrawing of large portions, owing to the fuller and more exact information they had taken the time to acquire in the field

did not happen to make it quite so clear. The north and south direction already remarked in regard to the volcanic mountains of Kiushiu would seem likely to be of the same late date as the later folding of the oil fields. The Kamoikotan rocks, which in Yesso and northern Nippon seem to have nearly north and south axes (the result apparently of much earlier folding than that of the oil bearing rocks) towards central and western Japan have axes that gradually run more nearly northeast and southwest or east and west, but that are yet possibly of the same age as the northern ones.

Though the road sketching including the rock exposures of the long journey of last year and of other previous journeys has not yet been wholly mapped it seems probable that it will give a fairly satisfactory means of subdividing the rocks of the Kamoikotan Series and possibly too of estimating roughly the thickness of the different parts, which no doubt will in all amount to far more than the former rough guess of 3000 feet. The series

[illegible]

[illegible] the granite, and of the [illegible] upon
[illegible] and [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible]

in comparison with that of western countries where volcanic rocks are abundant.

The series of the maps of our Yezo survey through the press has been continued, and now lately four more have at length been published since the appearance of the General Report of that Island; namely, a small map of the eastern part of Asia, and the maps of the Payanoma, Nuppaomanai and Bibai coal fields; making fifteen maps in all that have been printed. The Ichikishiri coal field is now the only one surveyed of which the map has not yet been lithographed. There remain in addition ten other unpublished maps of that survey, but as most of them are very large, and as they are nearly topographical merely and their geological importance is not so very great (except some of them in a negative way), they will perhaps not be printed at all.

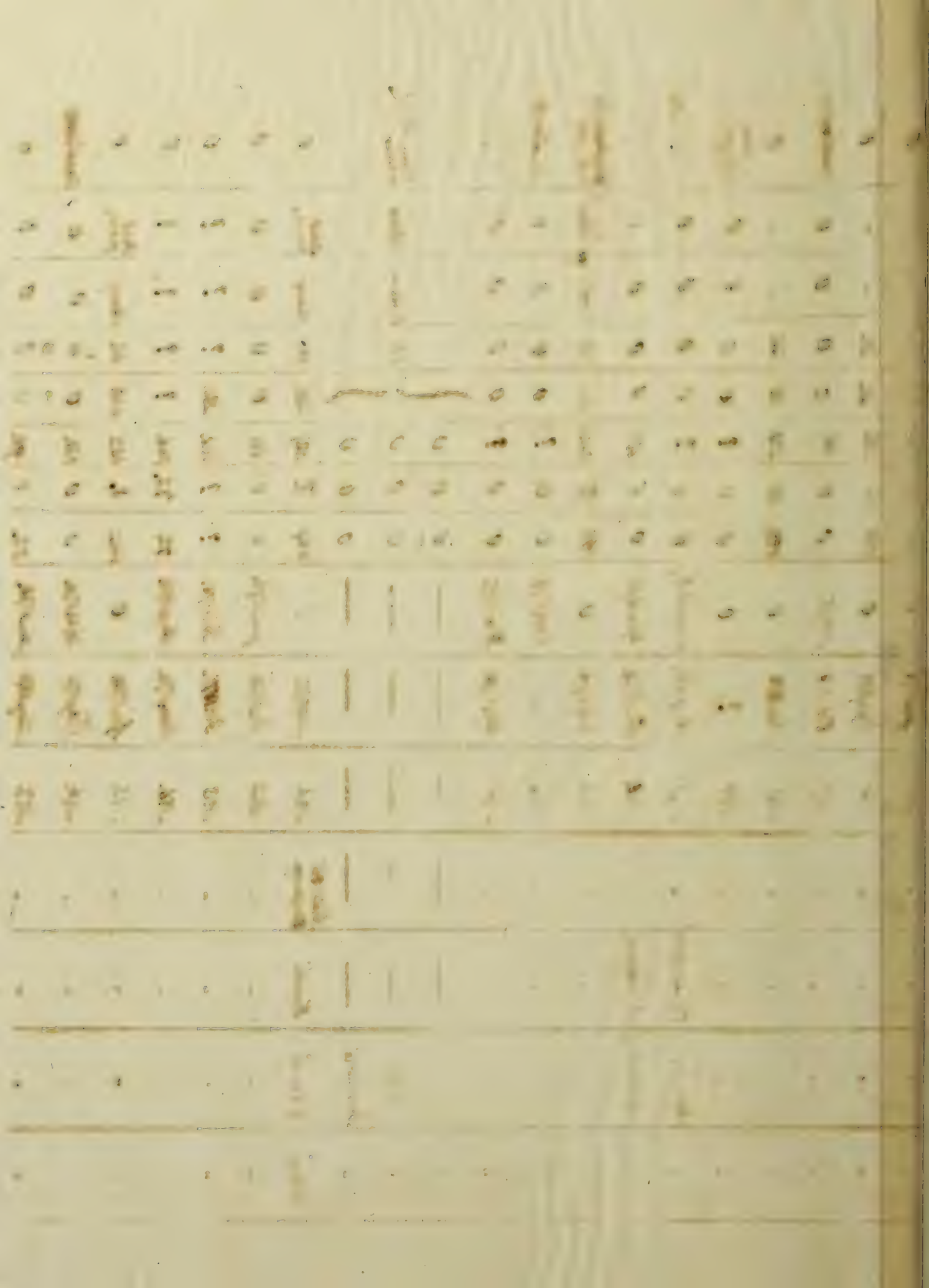
I have the honor to be,

Sir,

Your most obedient servant,

[illegible]

Kaufimachi; 9 Sept. [illegible]

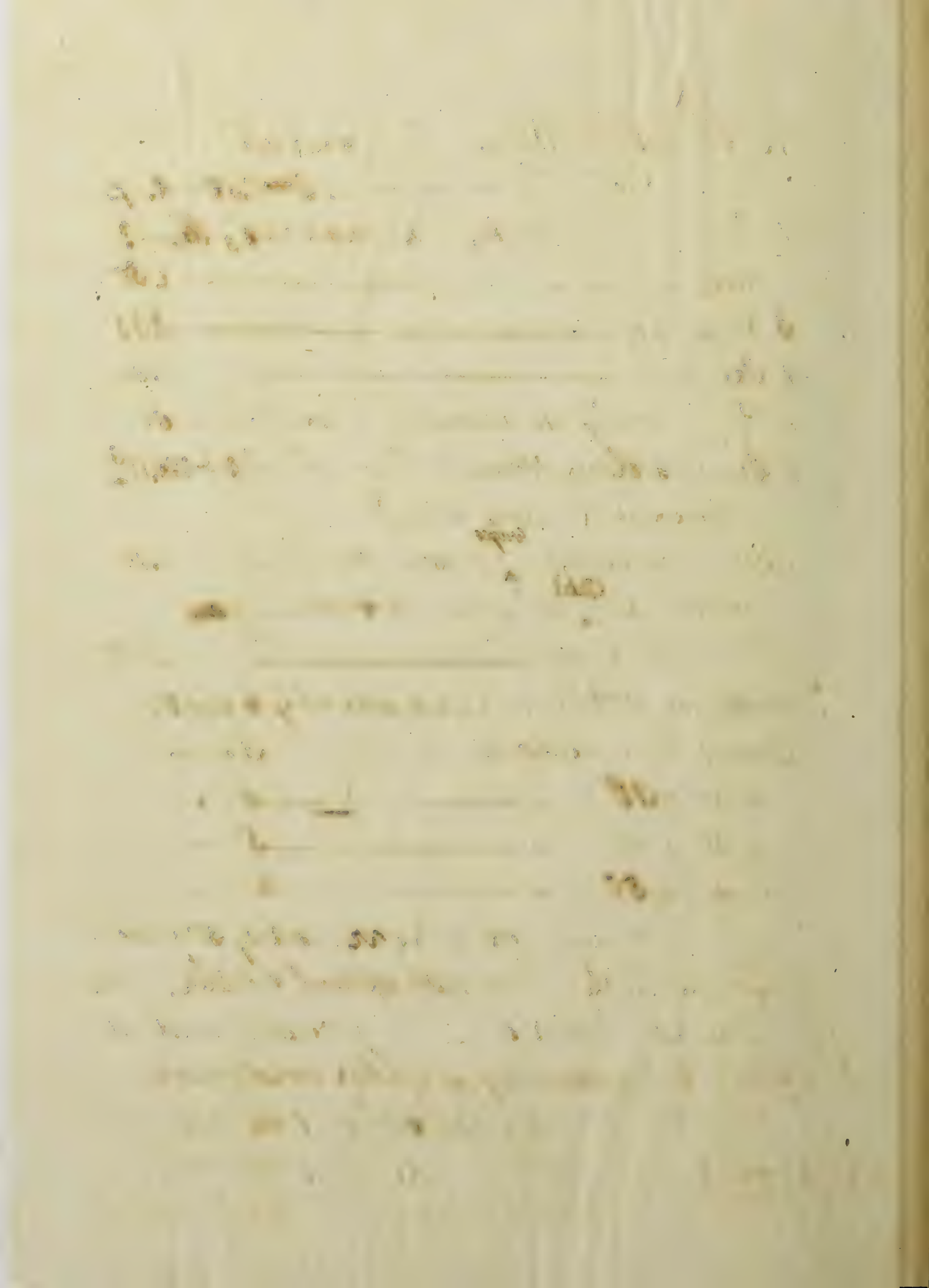


| | | |

1870	"	"	"	"	3	10.	5.	9.	3	.65	24.	8.	426.	5 23	377
1871	"	"	"	Zajčica	2	4	3	0	3	1.5	102.	102.	378.	66 2/3	33 1/3
1872	"	"	"	"	0	0	9.	0	0	0	0	18.	324.	0	162.
1873	"	"	"	Savska	7	1	1	2	1145	1.632	10.	14.	438.	175	125
"	10.	"	"	Strahovski pri 21.	8	2	0	1	135 1/3	16.9	100.	390.	42.	10	0
1874	10.	"	"	"	11.	0	5.	1	221.	55.	130.	18.	474.	4.444	5.5555
1875	10.	"	"	Selenburgova	29	4	1	23	1128	34 3/29	120.	108.	540.	47 1	39 3
1876	10.	"	"	"	128	1	3	239	2523	17.53	5.4	5	54.	77.0	2.7
1876	4.	"	"	Zelena	33.	22	0	0	1834	55 12/13	90.	144.	540.	100	0
				Hajnova pri Celju	0	2	0	0	0	1	0.8	10.	240	100	0
				[illegible]				1	67	2 1/2	120.	156.	276	100	0
				Kamnica	41	1	22	0	36.6	6 3/6	210.	270.	732.	9149	2.77
			"	Celje	18	1	2	0	176	9 7/7	100.	346.	630.	95 5/11	4.7
				Laška.	7	5	5	4	1114	159	150.	14	511	71 16/17	22 8/9
1877	10.	"	"		17		1	4 1.	1453	9.8	142.	6.	588.	94.5	5.5
1877	10.	"	"	Svečata	14	0	1	0	85	6 5/7	150.	138.	702	93 1/3	6 2/3
1878	10.	"	"	Avmaci	0	0	2.	0	0	0	0	212.	346.	0	116.

Examined		Place			Number of well				Show of Oil			feet		Percentage	
Year	Month	Province	District	Village	Well productive	Pore production	Wholly burned	Unfinished	Daily yield	Average daily yield	Greatest daily yield	Depth of depth	Greatest depth	Reduction well	Borrow
1878	Oct	Echigo	Kubiki	Tomo	2	0	2.	10.	4	2	0	18.	312.	50.	50.
"	"	"	"	Tanada	0	0	1.	1.	0	0	0	150.	204	0	100.
"	"	"	"	Biigo.	0	0	9.	3.	0	0	0	12.	72.	0	100.
"	"	"	"	Matsumoki	0	0	7.	6.	0	0	0	24.	210	0	100.
"	"	"	"	Tajima (Tanaka)	3	2	8	11.	5.5	1833+	8.	136.6	249.4	38.5	61.5
1879	July	Hiranno	[illegible]	Tomikura	8	4	3	2.	94.	11.3/4	160.	90	354	80	20
"	"	"	"	Nakiyuchi Hindoo	1	1	0	1	20.	20.	20.	30.	48.	50	50
"	Aug.	"	"	Hishari Hindooji	16	6	16	4	515.0	36.56+	300.0	27.	216.0	57.1	42.9
1879	"	[illegible]	[illegible]	Inirovu	0	1	1								
"	"	"	"	Asarina	0		1	1							
"	"	"	"	Saisanji	0	2									
"	"	"	"	Ebie.	0	6					60.	324.	594.		
"	"	"	"	Sugawara	27	5	4	4		9.±	400.	72.	450.	69	31

| | | |



Measures of Capacity

The Hoo is the base of all measures of capacity, and is a box 0.47 [illegible] square by 0.27 deep, containing 0.064127 cubic [illegible]. For dry measure it is for convenience in striking a rectangular metal rod 0.195 [illegible] thick by 0.017 [illegible] wide diagonally across the top; and the depth of the box is 0.271, so that the contents subtracting the rod are likewise 0.064127.

1 Hoo	= 0.3992	British gallon	= 4.792	U.S. liquid gallons	= 4.118	U.S. dry gallons
[illegible]	= 0.792	"	"	= 4.792	"	"	"	= 4.118	"	"	"
1 Hoo [illegible]	= 3.992	"	"	= 4.792	"	"	"	= 4.118	"	"	"

= 4.5 British bushels = 5.1475 U.S. bushels

Weights.

It is commonly reckoned that 25 mommes = 1 pound avoirdupois, and 160 mommes = 1 Catty. Thus:

1 Hoo of pure water at 62° F. with bar at 30 in. weighs 479.904 mommes = 5.992 lb avoirdupois.

58½ gallons = 1 mommes = 15 [illegible] = 100 [illegible] = 100 [illegible]

8.22155	mommes	= 1 oz.	troy.
92.7400	"	= 1 lb.	"
75	"	= 1 oz.	avoirdupois
120	"	= 1 lb.	"
160	"	= [illegible]	" = 1 kin = 1 catty

1600 momme = 133⅓ lbs. avoirdupois = 100 kin = 1 picul

1000 " = 1 kamme = 7⅓ lbs avoirdupois = 10.37546 lbs troy.

240 " = 3000 " "

2000 " = 2240 " " = 1 ton.

1600 " = 100 picul = 5.952 tons.

But some say (on his good authority I have not yet been able to ascertain) that 121.03505 momme = 1 lb avoirdupois, so that 99.5749 momme = 1 lb troy: and again (in the Kaitakaishi English-Japanese dictionary, 1872) that 121.6 momme 1 lb avoirdupois, and 100.05942 momme = 1 lb troy.

B. S. L.

25 Sept. 1879.

Report

on

Oil Well Statistics

gathered through the

Assistants of the Geological Survey of Japan;

by

[illegible]

Contents.

Page

[Insert the following on page 24 in place of the paragraph beginning: "But some say" &c.]

According, however, to a pamphlet on Coin Laws published by the Rajaka Mint under government orders of January, the mean of various Japanese [illegible] is given provisionally as such that one mome = 5777 grains, and = 3.75852 grammes; so that [illegible] mommes = 1 lb avoirdupois and [illegible] mommes = [illegible] Taiwan table published [illegible] says (on [illegible] good authority, I do not [illegible]) [illegible] mommes = 1 lb avoirdupois [illegible] and again in the Kaiserlich English-Japanese dictionary of [illegible] it is stated that [illegible] mommes = 1 lb avoirdupois and 100.05742 mommes = [illegible]

[illegible]

[illegible]

Kusoodzu Oil. — On the 6th of September, 1878, they visited the Kusoodzu oil exposures on the northern bank of the Aka River, 500 to 600 yards west of the village of that name, [illegible] four leagues and a half below Jeugawa; [illegible] was only a trace of oil in the gravel. At Watarito, about 600 yards north of Murasugi, a village about three leagues northeasterly from Kusoodzu they were shown some fossil fishes in the gray shales.

Hot Springs in Shimotsuke, Iwashiro, Uzen and Ugo. — [illegible] Kawarade and Mishiyama [illegible] likewise prepared [illegible] the following table and notes in regard to hot springs visited by them in 1878 in the provinces of Shimotsuke, Iwashiro, Uzen and Ugo.

Geological Survey of Japan.

Reports

of

Progress

for 1877 and 1878;

by

Benjamin Smith Lyman.

Tokei:
Published by the Public Work Department
1879.

Errata.

Page 10, line 10 from bottom, for even read: ever.
" 24, " 4, for Takinoga read: Takinoga.
" 130, " 13 from bottom for Frechville read: Frechville.

On the Map and Boundary:

[illegible] hand columnar section, lines 2, 4, 5 from bottom, for 587 read: 589.

[illegible] line 7 from bottom, for 586 read: 587

[illegible] hand columnar section, line 6 from bottom, for [illegible] read

[illegible] " " " " line 5 from bottom for 3.35–5.3 read: 3.35–3.35.

In the Report of Progress of Geological Survey for 1875 and Seven Coal Survey Reports:

Page 156, line 5, for 586 read: 587.
" " lines 18, 23, 31, for 587 read: 589.
" 157, " 1, & line 4 from bottom for 587 read: 589.
" 158, " 1, for 586 read 587.

In the General Report on the Geology of Yezo:

Page 39, line 7 from bottom for 586 read: 587.
" 40, lines 7, 12, 20, 24, for 587 read: 589.

In the Report on the second Year's Progress of the Survey of the Oil Lands of Japan:

Page III, line 22, for Hanagawa read: Hanagawa.
" 27, " 13 from bottom, for westerly read: westerly and.

Menagata is in Yamamotogori; Masugawa, Nigorikawa, Yabase, Kurokawa, Ringe and Tsukinoki are in Akitagori; and Oguni, Kiichi and Yokooka are in Yuligori. Of Menagata wells, No. 1 & 5 are Shizakakawabata and the rest, at Kuwaroki Yanchi. The wells of Masugawa are at Kusoodo; of Nigorikawa, at Higashidaira; of Yabase at Otsukaminami; of Kurokawa at Kusoozawa, of Oguni at Kureki; of Kiichi at Hodogazawa; and of Yokooka at Oogachi. The Menagata, Masugawa, Nigorikawa, Yabase, Kurokawa and the numbered Oguni wells belong to the Akita Oil Company; the unnumbered Oguni wells to Abe Kiemon; and the Kiichi and Yokooka wells to Ooba. The oil of Masugawa, Nigorikawa No. 1, Oguni No. 1, 5 and (new) are dark green and opalescent; those of Menagata No. 9 and Kurokawa No. 2 are greenish black opalescent; and those of the Kurokawa, Ringe and Tsukinoki shallowholes are black. Of Menagata No. 9 Masugawa No. 1, Nigorikawa No. 1, Oguni No. 1, 5 & 1 (new) are thick and heavy; and those of Kurokawa No. 2 and of the ~~Kurokawa, Ringe and Tsukinoki~~ shallowholes very thick and heavy. ~~Those of~~ The Oguni oil marks 38° Beaumé.

| | | |

Table compiled and calculated from returns made to the Mining Office [illegible]

	1874			1875			1876		
	1st day	2d day	3d [illegible]	1st day	2d day	3d [illegible]	1st day	2d day	3d [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
" reduced	63764	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Produce,									
Ingot copper	696.6	1570	2526	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]
Coarse "	3109.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0
Blue vitriol	5323	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Within days:									
Mining	156	16[illegible]	3[illegible]	[illegible]	[illegible]	[illegible]	167	[illegible]	[illegible]
Reducing	156	163	319	[illegible]	[illegible]	324	167	168	[illegible]
Both	312	326	638	[illegible]	324	[illegible]	334	338	[illegible]
Days [illegible]:									
Mining	23[illegible]	24975	48397	[illegible]	[illegible]	[illegible]	[illegible]	56326	101379
Reducing	4498	6126	10624	6621	[illegible]	17262	14[illegible]	16566	[illegible]
Both	27[illegible]	31121	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	72[illegible]	132[illegible]

Sales:									
Ingot copper	696.6 l	157.0 l	853.6 l	986.3 l	0	986.3 l	8012.7 l	6130.[illegible] l	14142.7 l
Coarse "	2417.7 "	5254.4	7672.1 "	[illegible] "	7282.4 l	[illegible]	"	0	0
Blue vitriol	124.4 "	697.3 "	821.7 "	986.3 "	1612.1 "	2598.3 "	[illegible]	[illegible] "	[illegible] "
Expenses:									
Mining	$5413.50	$5774.04	$11187.54	$6728.[illegible]	$8970.01	$15594.11	$10134.56	$11265.[illegible]	$21396.[illegible]
Reducing	1603.50	2487.70	4091.20	2711.58	3608.87	6320.45	6[illegible].54	7786.[illegible]	13938.56
Both	7017.00	8261.74	15278.74	9439.58	12578.88	22018.56	16284.10	19[illegible]	35335.[illegible]
Taxes:									
Lease	210.00	210.00	420.00	210.00	210.00	420.00	210.00	210.00	420.00
Ore	133.26	227.21	360.47	0	0	0	0	0	0
Both	343.26	437.21	780.47	210.00	210.00	420.00	210.00	210.00	420.00
Whole outlay	7360.26	8698.95	[illegible]	[illegible]	12788.88	22438.56	16494.10	19264.22	35755.[illegible]

| | | |

Table compiled from the [illegible] table: [illegible]

	1874			1875			1876		
Product:									
Surplus ore	4737.6 k	-4737.6 k	0	1604.5 k	-1265.0 k	14780.0 k	-5280.0 k	[illegible]	2370.0 k
Copper in vitriol (at most)	[illegible]	735	208.6 k	250.5	407.5	660.0	[illegible]	[illegible]	[illegible]
Total copper (at most)	[illegible]	4773.5	[illegible]	5552.0	7277.9	12829.9	[illegible]	6442.0	14834.7
Daily average [illegible]:									
Mining	150.0	153.9	151.7	196.3	244.5	214.4	269.1	331.3	[illegible]
Reducing	[illegible]	37.6	[illegible]	40.9	65.7	53.3	87.0	98.6	[illegible]
Both	178.2	191.5	[illegible]	237.1	306.1	271.6	356.8	429.9	393.7
Percentage:									
Copper [illegible]	5.09	3.37	4.24	5.27	5.73	5.52	2.65	3.31	2.90
[illegible]	84:16	81:19	[illegible]	83:17	79:21	81:19	76:24	77:23	76:24
[illegible]	75:24	71:29	73:27	63:37	72:28	71:29	63:37	56:44	64:34

[illegible]									
Mining	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Balancing	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]									
[illegible]	7.7[illegible]	4.20	5.[illegible]	5.54	7.14	6.51	3.2[illegible]	[illegible]	[illegible]
Balancing	2.5[illegible]	1.75	1.99	2.57	2.[illegible]	[illegible]	1.9[illegible]	[illegible]	2.75
Total	[illegible]	5.95	7.45	8.11	9.9[illegible]	[illegible]	5.[illegible]	[illegible]	6.9[illegible]
Price per [illegible]									
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Value of product									
[illegible]	674.83	152.09	826.92	176.70	—	176.70	9515.08	7279.37	16794.45
[illegible]	2524.51	3707.59	6232.10	4159.27	5580.57	9739.[illegible]	—	—	—
Blue vitriol	99.81	54.02	153.83	177.54	293.41	472.95	498.57	409.43	908.00
All [illegible]	3299.15	3913.70	7212.85	4515.51	5873.[illegible]	[illegible]	[illegible]	7688.80	17702.45
[illegible]	374.27	-374.27	0	888.89	-70.08	818.81	-292.51	1461.10	1168.59
All [illegible]	3673.42	3539.43	7212.85	5404.40	5803.[illegible]	11208.30	9721.14	9149.90	18871.04
[illegible] loss	368[illegible].4	5159.52	8846.36	4245.[illegible]	6984.98	11230.26	6772.96	10111.32	16884.28

Price received:									
Ingot copper	$674.[illegible]3	$152.09	$[illegible]25.92	$176.70	0	[illegible]	$[illegible]	7279.37	[illegible]
Coarse "	1964.37	4269.20	6233.57	[illegible].14	$58[illegible]	973[illegible]	0		
Blue vitriol	23.32	129.13	152.45	179.54	293.41	472.95	[illegible]	409.43	908.00
Expenses:									
Mining	$5413.50	$5774.04	$11187.54	$6728.10	$[illegible]	$15698.11	$10131.56	$11[illegible].20	$21396.76
Reducing	1603.50	2487.70	4091.20	2711.58	36[illegible].87	6320.45	6152.54	7786.02	13938.56
Both	7017.00	8261.74	15278.74	9439.68	12578.88	22018.56	162[illegible]	19051.22	35335.32
Taxes:									
Lease	210.00	210.00	420.00	210.00	210.00	420.00	210.00	210.00	420.00
Ore	133.26	227.21	360.47	0	0	0	0	0	0
Both	343.26	437.21	780.47	210.00	[illegible]	420.00	210.00	210.00	420.00
Whole outlay	7360.26	8698.95	16059.21	9649.68	12788.88	22438.56	16494.10	19261.22	35755.32

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Report

on the

Ashio Copper Mines;

by

Benjamin Smith Lyman.

A Report on the Ashio Copper Mines with a Sketch Map; by Benjamin Smith Lyman.

1. Situation.
2. Topography.
3. Geology.
4. Mines.
5. Furnaces.
6. Shipment.
7. Statistics.
8. Conclusions.
9. Map.

To His Excellency
Mr. A. Yamada,
Public Works Minister.

Sir:

I beg to make you the following report on the Ashio Copper mines visited by me on the thirtieth of June, 1878. It was originally sent in on the 12th July 1878; but is now revised and somewhat amended, particularly by means of the Mining Office returns and a Sketch map is added.

1. Situation. The Ashio copper mines are in Tochigi Ken, Shimotsuke Province Tsugagoori (Asogori) in Ashio villages in two groups, the principal one at or near Idesawa, just west of Akahira, [illegible] mines (1 ri 8 chos) north of the main post village

1

of Ashio; and the smaller at Sunokobashi about half a league in the same direction from the same village. The main village itself is six leagues and a half southwest of Nikkoo on the road to Kootsuke (Ivorkin) and close to the boundary line of the province; and is four leagues and a half south of Chiusenji village by a foot path impassable to loaded horses.

2. Topography.— Ashio is in a narrow, steep sided valley, half a dozen leagues inside the south eastern edge of the great mass of high mountains that form the back bone of the island of Nippon and that here border the wide plain of the Tone River.

It is separated from Nikkoo and Chiusenji (which are in the valley of the Daiya River) by high mountain passes; and is on the northwesterly bank of the Watarase River, which flows into Kootsuke, and afterwards bending south and southeastward reaches the Tone River near the southeasternmost corner of that province.

The two groups of mines are approached by separate valleys northerly branches of the main valley of the Watarase river with high steep hills between, and the whole neighborhood is filled with such hills and mountains. In the middle of the

larger group stands the Bizendate Mountain, scarcely half a league southerly from the Kooshiszan; and the mines are within a space of about half a league in diameter on the upper most waters of three or four valleys that descend from the central point. The Sunokobashi group is much smaller, and lies perhaps half a league in a straight line southeasterly from Bizendate, in a small valley that empties into the Gatarase River at the main village of Ashio.

Ashio village is about 2150 feet above the sea (about the same height as the principal temples of Nikkoo from which it is separated by a pass about 1800 feet higher); and the lowest mines of the main group are 2550 feet or more above sea level. The office of the mines, at Idesawa, is at a height of about 2550 feet (by aneroid corrected for temperature).

3. Geology.— In General.— The rocks of all the mountains close about Ashio are wholly of what we have closed together as the Kamoikotan series; although near Chiusenji there are recent volcanos, and probably ancient ones also. At the village of Ashio the rocks are a hard black rather [illegible]

clay slate, of somewhat imperfect cleavage in many places, the same as the black slaty rocks that are so characteristic of the Series in Yesso and near Kamaishi elsewhere in Nippon. But the mines at least near Akahura and Idesawa (and the rock is said to be the same at all the mines) are in apparently an underlying rock a light gray quartz porphyry, containing very abundant grains of glassy blackish quartz of the size of small peas in a whitish feldspar matrix. In the rock there are also here and there many small bits of the black slate as large as peas or beans; but the same rock is widely seen on the road to Nikkoo and generally (though not always) is without such bits of slate. On that road it will appear to contain orthoclase (occasionally coarse) and at least in some cases, probably always, Oligoclase and quartz in a dark or light gray, sometimes dark green matrix which is often so scanty as to give the rock at first sight a granitic or syenitic look; but sometimes with its numerous and rather larger roundish grains of quartz and with the fragments of slate it looks more like a pudding rock. A few leagues still further east on the road from

Kawichi to Aidzu there are many exposures of a corresponding rock; but there it is still more a pudding rock with nutsize pebbles or fragments of blackish and pinkish quartzite and of grayish green feldspar.

The dips of all the rocks near Ashio are nearly vertical, and are perhaps sometimes reversed; so that the structure is somewhat doubtful. But the black slaty rocks would seem to be in the form of a narrow, sharp basin, running from northeast to southwest with its axes a little northwest of the main village. These rocks reach to within a few hundred yards of the mines; and these the metalliferous rocks seem to underlie them conformably, on the north western side of the basin.

Veins.— The veins appear to be very numerous, perhaps fifty or more; and they run generally northeast and southwest, it is said, though there are many in other directions, as for example, N. 60° E. and S. 60° W., north and south, northwesterly and southeasterly. The dip of the veins is said to be generally about vertical. The greatest width of ore is in the Ogiri mine which I measured it myself at one point as seventeen feet

[illegible] width with a dip there of 55° south 20 west, that is with a strike of N. 70° W. For a distance of about 150 fathoms horizontall then a width of at least fourtenths of a foot is mountained; but then the width quickly becomes about one tenth of a foot or less, which is said to be the greatest width throughout the rest of the mine. The wide point is just off the drainage level about 140 fathoms from the mouth of the mine and fifty fathoms from the face of the level. The next best vein is in the Hachininmabu; the third best in the Nakashiki (E. N. E. & W. S. W.?); and the fourth best in the Honkuchi (northerly and southerly?). Those were the only four mines worked by the owner at the time of the visit, but a score of miners were working on their own account in small mines in the Bizendate some veins that were said to be about half a tenth of a foot wide. The ore is said to be wholly copper ore except a very little lead ore in one mine (the Sasayama, on the north of Bizendate). At the office of the mines a specimen of the thick part of the vein of the Vogiri mine, showing the width of the vein half a foot, and nearly a foot long and a third of a foot broad, contained perhaps one third of its bulk of copper

pyrites and the yet white quartz. Two other large hand specimens from the same place were rather richer in copper pyrites, which was partly covered with a thin coating of black oxide of copper; and the gangue was likewise only white quartz; and in none of them was to be seen any trace of other metals. The veins are said to be easier to work in the country; which is for all the veins the same very hard light gray rock already described.

According to Ono Ranzan (quoted by Mr. Geerts (Trans. Asiat. Soc. Japan for 1874 III:29) malachite, (green carbonate of copper, rokusho) and chessylike (blue carbonate of copper, kunsei or irukonjoo) are found at the Ashio mines; and Mr. Geerts also mentions that olivenite [illegible] of copper, roo-yoseki or hisomankadoo) is found at Ashio, but I saw none of the three; [illegible] their quantity is very [illegible] indeed. There were formerly some silver mines near Ashio (probably those marked on the map); but they have been abandoned for about twenty years. A little quartz was dug there in 1877; but the deposit of crystals was soon exhausted.

4. Mines.— The Ashio mines have been worked for about 269 years, since [illegible] the year

of the Keichoo epoch (1610). In March 1577 they were bought from the bankrupt Oono by the man who still owned it, at the time of the visit, Soeda Kinichi, the chief official (Karoo), it is, said, of the Prince of Sooma.

The number of the mines would seem to be about as large as the number of veins perhaps fifty or more, so though sometimes more than one vein is worked in a mine, there are other veins that have more than one mine. But at present it is said that only four mines are worked by the owner; named in the order of merit; the Oogiri, the Hachininmaki, the Nakashiki and the Honkuchi, and there are some small mines worked by about twenty independent miners (wildcats) who sell the metal they produce to the owner of the mines and furnaces at a rather lower price of course than its real value. The mines are all drifts very narrow, low, crooked and uneven, run horizontally into the hill sides, are sometimes 200 fathoms or more in length (as in the case of the Oogiri mine); and in no case go below the level of natural drainage, so that pumps are not used at all. Although owing to the firmness of the rock they are generally without timbering there are many [illegible]

where timbering is used. The mines are lighted with the common dried slender bamboos.

The ore dressing works are like those common of other Japanese mines. The ore is pounded by five women with hand hammers on flat stones set in the earthen floor of a long building, and is afterwards washed by hand with bamboo sieves in five water vats about three feet square in the same floor. No stamps nor water power in any way, not even the power of animals, is used.

5. Furnaces and other works. — The ores are reduced by roasting and smelting for copper and by roasting, leaching, boiling down and crystallizing for blue vitriol.

There are it is said about fifty roasting kilns at Ideyawa (besides about ten at Sunokobashi) huddled together irregularly at the upper end of the furnace village and alongside the blue vitriol works; but only small shown them are just now in use, about a dozen for the ore to be smelted. There have a horizontal section, somewhat pear shaped with the larger end towards the back, and about five feet across either way and three feet and a half high, and with one opening at the bottom

of the front about a foot high and wide; and they are built rudely of stones in blocks of some six or eight. For the ore that is to be smelted the charge is 240 kamme (2000 lbs.) of ore, one tana (54 cubic feet) of wood and 5 kamme (42 lbs.) of charcoal; and the roasting lasts about ten days varying however with the weather. The ore is roasted in that way twice before smelting. The regulus or matte (called here rinkadoo but the same as the kawadoo of Osarusawa and Ani produced from that amount of ore in the smelting furnace is roasted three times after each one of three smeltings; and each roasting lasts about the same time and needs about the same amount of fuel as the roasting of the raw ore does. The ore that is to be leached is roasted in similar but larger kilns, and the charge is: 1200 kamme (10000 lbs) of ore, tana (108 cubic feet) of wood and 5 kamme (42 lbs) of charcoal, and the time is about seven days, varying with the weather, and the roasting is done only once.

There are three smelting furnaces at Sidasawa but only one or two in use at present and one

[illegible] as well as many legends. [illegible]
are always the most [illegible] [illegible] by the
most [illegible] gradually [illegible] and gently [illegible]
and [illegible] [illegible] [illegible].

[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]

but gradually gets better, and after that there are no hills to cross and the road is called pretty good. At 16 miles (6 ri 15 chos) from Ashio village the town of Wanawa is reached; and at nine leagues the town of Vomama, and from there, over the great plain of the Tone River there is a road passable for wheels to the Nakasendo and so to Ueda which is 36 ri from Ashio. The Tone River would be reached in something like 15 leagues from Ashio, and freight could be sent down it by boat to Ueda.

The road across the pass to Nikkoo would be very difficult to convert into a good waggon road, and the height to be crossed could not be essentially lessened. But the road from the mines to Ashio village could without serious trouble be made into a waggon road, and probably the road down the valley to Vomama might be so improved. It is possible that even the streams all the way from the furnace, downward may at some future day be made navigable with black water; but the number of dams and locks required would be very great, with the countervailing advantage [illegible] dams would give a great amount [illegible]

power that might be turned to account and would be very valuable.

7. Statistics.— The two following tables are compiled or computed from apparently in the main trustworthy returns made to the Government mining office for the years 1874–1876.

Production.— As stated to me at the office of the mines, the ore smelted from July to 31 December, 1877 amounted to 17270 kamme (143917 tbs); and from 1 January to 31 May 1878, to 20290 kamme (169083 tbs); or in all in the eleven months 37560 kamme (313000 tbs). The ore worked for blue vitriol was about nine times the amount of the slag so worked; and both together amounted, it is said to about 20 times the weight of the blue vitriol produced (and yielded therefore at most 1¼ percent in copper); which would give 57283 kamme (477360 tbs) as the amount so leached from 1 July to 31 Dec. 1877; and 69884 kamme (583200 tbs) from 1 Jan. to 31 May 1878; or 127167 kamme (1060500 tbs) for the eleven months.

The charcoal used for roasting and smelting the ore for copper (not for the blue vitriol) from 1 Jan. to 31 May, 1878, was 11600 kamme (89333 tbs.

say 4892 bushels). The amount of wood used is not exactly known; but reckoning eleven tana for every 240 hamme (2000 lbs) of ore smelted (one tana for each of the eleven roastings of ore and regulus), it would have amounted in the same five months to 930 tana. Reckoning in the same rough way the wood used for roasting the ore for [illegible], two tana for 1200 hamme of ore, the amount of wood used for roasting would be 116⅔ tana in the same five months. The wood used for boiling down the vitriol was said to be about 45 tana a month which would give the amount of 225 tana for the five months; but that is a very rough estimate. In like manner reckoning the charcoal used for roasting the same ore at five hamme for every 1200 hamme of ore, it would have amounted from Jan. to 31 May, 1878, to 291 hamme (2425 lbs or say 13 bushels). The whole amount of charcoal used at all the works would have amounted then from Jan. to 31 May, 1878, to 10891 hamme (90758 lbs or say 5[illegible] bushels) and with the wood for the same time to 127⅓ tana (68670 cubic feet or 536½ cords).

The copper produced from 1 July to 31 Dec. 1877 (as stated to me) was 44879 catties (59827 lbs),

and from 1 Jan. to 31 May 1878, was 36600 catties (48800 lbs); or in all for the eleven months 81470 catties (108627 lbs). The blue vitriol made from 1 July to 31 Dec. 1877 was 19890 catties (26520 lbs); and from 1 Jan. to 31 May 1878, was 24300 catties (32400 lbs) or in the eleven months was 44190 catties (58920 lbs).

It will be seen, however, further on that there must have been some gross errors in these statements precise as those seem to be.

Labor.— The whole population of the mining villages at the time of the visit was said to be about 300 souls of whom 200 were employed at the mines or other works, besides sometimes a little work from the other hundred of small children and old men, and moreover perhaps 100 others, shopkeepers, farmers and the like of the main village work more or less in one way or another for the miners. Of the 200 workers eighty ~~[illegible]~~ miners, about fifty carriers of ore, and seventy ore dressers, furnace men and the rest. Among the seventy are two furnace men, six bellows men and nine men and women who work in the blue vitriol manufactory.

There was it was said, a comparatively

large amount of "dead work" and house building doing just then, so as to get the mines and works into good running order in hopes of a better production in future

Prices. — Wood costs delivered at the furnaces 75 sen for one tana of 54 cubic feet (apparently chiefly hard wood), or say $1\frac{4}{10}$ cents a cubic foot, or $1.80 a cord (128 cubic feet). Charcoal costs one sen for 55 kamme (458 lbs); or say four cents a bushel.

The cost of mining tools is reckoned at about six cents a day for each miner, and they are provided by the owner of the mines.

The miners are paid for one day's labor 20 sen and supplied with seven goo of rice and 40 mea of miso, which together cost $6\frac{1}{5}$ sen; making the whole cost of a day's labor including the tools $32\frac{1}{5}$ sen; or aside from the tools $26\frac{1}{5}$ sen. The carriers of ore (horiko) are paid 10 sen a day and the same food; making their day's labor amount to $16\frac{4}{5}$ sen. Rewards are also given for good work. In paying by the piece ten dollars are paid for cutting in comparatively soft rock a length of five feet by a height of four feet and a width of $2\frac{1}{2}$ to three feet (say 55 cubic

feet); and in hard rock 20 dollars are paid for the same space; and in either case the before mentioned amount of daily rice and miso and the tools are supplied in addition. The ten dollar piece of work would last about a month and the twenty dollar are two months so that the cost would be, including the food and tools, say $13.16 and $27.327 respectively; or about 25 cents and 43 cents a cubic foot. But perhaps something should be added to that for the carrier's wages.

The carriage of one picul (133⅓ lbs) either of copper or of blue vitriol, from the furnaces to Yedo costs 50 cents.

The selling price of the crude copper at Yedo or Yokohama is $16 a picul; and of the blue vitriol, $8.90.

8. Conclusions.— The ore smelted from July to 31 Dec. 1877, yielded according to the statements made to me at the office of the mines about 41⅗ per cent. of coarse copper evidently an absurdity since perfectly pure copper pyrites contains only 34.6 per cent. of copper; and from 1 Jan. to 31 May 1878, yielded 28¼ per cent., a result almost equally

improbable. The foregoing tables for 1874–1876, also show a very widely different state of things. It is necessary therefore to consider what the true facts in regard to 1878 probably are. There are several circumstances that seem to show that the yield of copper as stated above is greatly exaggerated. For example the first rough statement at the office of the yearly yield of copper was "about 60000 catties", which is scarcely more than one of what was afterwards given with more precision as the rate of yield for the first five months of 1878; and yet there did not the least disposition at any moment seem to be the least disposition at the office to underrate the yield of the mines or their merits. It was also told us in the village that the copper was sent to Nikkoo only about once a month; and at the mine office they said that one horse load of it was twenty hammer; and last year near Nikkoo we were told that ten or fifteen such horse loads were taken out in one train. Taking the average number of loads in one month to be thirty the product in five months would be 25000 lbs (3000 hammer) or nearly 15 per cent of the weight of ore stated to be smelted from 1 Jan.

to 31. May, 1878; an average percentage that would be even higher than that at the other copper mines yet visited by me in Japan. At those visited (Osamizawa, Ani, Yusenji, Kanayama) the percentage of yield of refined copper to the ore smelted does not vary much from 12 percent; because the methods of preparing the ore are, the same at all the places and the degree of concentration by those mechanical means is just about the same everywhere. The true yield of the mines in the first five months of 1878 would seem then to have been at most not more than 3000 kamme (25000 lbs) about half what was stated above; and the yield of the ore in coarse copper about 14 percent. At somewhat greater yield of copper in the preceding six months may have been partly due to the use of ore previously mined and not counted in the statement above given.

Moreover a consideration of the average income for each workman leads to a like result. Subtracting the cost of carriage of the products to Yedo, the value of the copper at the furnaces would be $15,50 a picul and the blue vitriol $2.40 a picul. The value therefore of the copper stated as produced

from 1 Jan. to 31 May, 1871 would be $5673; and of the blue vitriol in the same time $2041.20; or both together say $7714. In the same time the cost of the fuel used would seem to have been: wood, about $954, charcoal, about $196; or both together $1150. Subtracting that from the value of the products, the remainder is about $6564 for the five months, or an average of $1313 a month as the result of the labor of 200 workers, or over six dollars and a half a month to each one. Such a result would be much better than what can be shown at the famous and apparently more profitable copper mines of Chaugava and Ani; and yet it is not claimed at Ashio that the mines are now worked at a profit, on account of the unusual amount of "dead work", building and such like preparations that they are making. Perhaps the number of workers should rather be reckoned at 300 if not more (and the villagers spoke of the whole number as about 1150 (corresponding well with the returns for 1876), meaning perhaps the whole population, of which the workers are commonly two thirds); and then the average monthly income would be about four and three eighths

Station	Place	[illegible]	[illegible]	[illegible]	Number of specimens
L	Ooise	[illegible]	[illegible]	[illegible]	1
L2369a	[illegible]	[illegible]	[illegible]		1
L6020c	[illegible]	Kurihara	Rikuzen	"	1
L11001 [illegible]	[illegible]	Yosa	Tango	"	2
L14452 i	Anari	[illegible]	Tosa	[illegible]	1
L14690 [illegible]	near [illegible]	[illegible]	Awaji	Awaji	1
I2369 a	Yosoo	Karika	Echigo	"	1
I2407 ia	Kaji[illegible]	"	"	"	1
I2407 ga	"	"	"	"	1
I2424 ia	Ohada	"	"	"	2
I[illegible]	[illegible]	"	"	"	2
L1131 [illegible]	[illegible]	[illegible]	Ishcari	[illegible]	2
L1570 h	Chashi	Tomamai	Teshio	"	3
L158[illegible]	[illegible]	[illegible]	"	"	1
[illegible]155[illegible] ia	Makumbetsu	[illegible]	Hidaka	"	1
[illegible]	"	"	"	"	2
T826 a	"	"	"	"	1
T[illegible]	"	"	"	"	2
T[illegible]69 g	"	"	"	"	1
T814 c	"	"	"	"	1
T874 g	"	"	"	"	1
Z661 i	"	"	"	"	1
Z661 j	"	"	"	"	1

Station	Place	District	Province	Island	Number of specimens
Z552a	Matsumoto	Nagano	Hidaka	Yezo	1
—	"	"	"	"	1
—	Shinjunai	"	"	"	3
—	Shiranuka	Shiranuka	Kushiro	"	3
—	Yutoro-mugi	Kunimoppe	Teshio	"	1
[illegible]370b	Naie	Sorachi	Ishoari	"	4
[illegible]370a	"	"	"	"	1
—	"	"	"	"	1
Y721a	Bibai	"	"	"	1
Y721b	"	"	"	"	17
B883c		"	"	"	6
[illegible]		"	"	"	4
[illegible]		"	"	"	1
E[illegible]		"	"	"	2
[illegible]		"	"	"	1
Y552d	Anpomanai	"	"	"	2
[illegible]	"	"	"	"	2
[illegible]	"	"	"	"	1
K955a	"	"	"	"	22
Y	Musumbetsu	"	"	"	1
C	Musa	[illegible]	[illegible]	"	1

—	"	"	"	"	1
—	"	"	"	"	1
—	"	"	"	"	3
—	"	"	"	"	1
					4
	"	"	"	"	1
—	"	"	"	"	1
	"	"	"	"	1
	"	"	"	"	1
					17
					4
					1
					2
					1
					2
					1
					2
					1
					1

dollars a month for each labour, still quite large compared with those other mines. It is possible, however, that the cost of labor is in reality essentially greater here than in the more northern provinces, and possibly the workers are more regular at the work, or that only those have been ~~reckoned~~ counted who are comparatively so.

Reckoning, however, the yield of copper from 1 Jan to 31 May, 1878, as just one half that was stated above, that is at 18300 catties (24400 lbs), its value at $15.50 a picul) would be $2836.50; to which adding the value of the blue vitriol (if its amount be not also exaggerated) $2041.20, we have about $4877.70 as the whole product of the mines for five months. Subtracting the cost of fuel $1150, there remains about $3728 for five months or about $746 a month; which divided among 300 workers would be $2.49 a month to each worker; still not a bad average compared with that of Osarnjawa. If the amount of blue vitriol produced was also doubly overstated (and the workmen in the manufactory estimated it at 400 hamme a month instead of the 777 hamme which the statement of the office would make it appear to be); the income

[illegible] the [illegible] would be about $2707
[illegible] months or about $[illegible] a month (or about
[illegible] a year), which [illegible] among 300 men
would be $1.80 a month. And that considering
the yield of other mines and the fact that unproductive
[illegible] and "deadwork" is just now so much carried
[illegible] the Ashio mines) I must hold to be most
[illegible] not less than the true yield of the mines,
[illegible] some explanation be furnished of the [illegible]
[illegible] discrepancy between the stated yield
[illegible] from the ore and the greatest possible
yield of perfectly pure ore.

The amount of charcoal used for the smelted
[illegible] the first five months of 1878 was according
to the statements given above about 125½ hammer
[illegible] of ore or about 1¼ to one. The
[illegible] for the amount of wood used are too
[illegible] and uncertain to be of much value, [illegible]
[illegible] precise statement could not be obtained.

[illegible] for the merits of the ore veins, it is [illegible]
that very great hopes have been built upon the
[illegible] in the Ogiri mines, [illegible]
[illegible] is an extent. On the [illegible]
talked of introducing pumping machinery [illegible]

to dig deep below water level, and of cutting a new drainage level a thousand fathoms long. But it would be foolish to be led into extravagant expectations by a single little widening of one vein through a space of two fathoms among so many hundred explored fathoms of that and fifty other veins which have it is admitted none of them more than a tenth of a foot in width and many of them not even that. It would not be safe to count on an average width of more than one tenth of a foot at the very most even in the Vogiri. With that thickness a space five feet long by four high and 2½ or three wide and a less average working width than that could on whole hardly be counted on) would contain two cubic feet of the vein; or about one cubic foot or say 250 lbs (3 Shumme) of copper pyrites, supposing that about one half the bulk of the vein matter was pure ore. That amount of perfectly pure ore would contain 86½ lbs (about 64 catties) of pure copper; worth at $15,50 a picul, $[illegible] (the value of the coarse copper). As already seen the cost of mining that space would be at least from $18,66 to $[illegible]. It is plain therefore that, at present prices in such

hard rock, with a less average width than one and a half tenths of a foot of a vein that contains not less than one half of pure copper pyrites not even the bare expense of mining would be recovered; saying nothing whatever of the manifold expenses of dressing and smelting the ore. Nor of the interest on the working capital and on the purchase money of the mine (which last alone, according to village rumor, it is to be hoped without a word of truth in it, was the important sum of $70000 or $80000, and at the ordinary interest rate of 18 percent, a year would yield a yearly return of about $135.00, or about as much as the highest stated value of the present products after subtracting the cost of the fuel).

Taking the cost of dressing and smelting the ores at about half the cost of mining (as in the years 1874 to 1876); it would need a width of about quarter of a foot in comparatively soft rock or half a foot in hard rock to repay the mere cost of labor. There cannot however in my opinion be the least pretense that a width of a quarter of a foot would be maintained as an average of any large portion of the

vein containing one half its bulk in pure ore even in the Ovgiri mine, much less in any of the others. It would seem perfectly idle therefore to discuss the feasibility of working the mines at present prices, and that the sooner they are closed the less money will be lost.

These conclusions are very fully borne out, too, by the foregoing tables for 1874–76, from which it is clear that the whole value of the finished products never in any half year equalled the mere cost of mining the ore from which they were obtained, and rarely equalled the half of their whole cost in labor; so that there was an average yearly outlay of about $24000 for labor to produce about $12000 in value, with a dead loss of fire of about $12000 a year. Yet this loss went on from year to year, increasing with the outlay until at length another owner was found ready to enter still more boldly on the same course. Now he can it be said that capitalists in Japan are timid about venturing money in mining? If merely the foregoing imperfect returns to the Mining Office and their deductions could have been published years ago, no doubt many thousands

of dollars would have been saved; and doubtless still the loss of many tens of thousands of dollars might be prevented by a like study and publication of the other returns now buried in the Mining Office.

If, however, the time should ever come when such narrow veins in such hard rock can be worked with profit, it would be advisable to begin with a thorough geological and topographical survey of the whole field. It would thereby be possible to decide whether a lower drainage level could advantageously be driven and at what point. There is already talk of driving one from the Vojiri mine southwesterly about a thousand fathoms a lower, larger valley; but if such an important work should be undertaken without a proper topographical survey the chance would be very great of making some serious blunder. A complete geological survey would also be very likely to discover important facts bearing upon the working of the [illegible] lessening the uncertainties of mining.

It is probable at any rate that some one level might be selected for the best drainage

[illegible] time to serve
[illegible] of a [illegible] in [illegible]
[illegible] [illegible] [illegible] [illegible]. A furnace and
[illegible] of a very inexpensive character could
[illegible] [illegible] [illegible] [

with the rates of wages, should prevent the introduction of the labor saving processes of vulcan smelting furnaces; yet it is not unlikely that some minor improvements might be made in the dressing of the ore, for example by the use of crushing machines or rollers or jigging sieves driven by water power or by animals.

In regard to shipment it would seem very obvious that if there were no controlling personal considerations the products should be sent to market down the Tuscarora valley in to Hoodyute, even in case the navigation of that river could not be made possible, the roads should be improved so far as means would permit; not only because the cost of carriage would thereby be directly reduced, but because indirectly, by making it easier to bring the comforts of life to the mountains, living there would be made easier and labor would be made either nominally cheaper or at any rate more effective and consequently in reality cheaper. A time effect would be furnished by the encouragement of schools.

But the most important [illegible]

[illegible] is the abandonment of the mines altogether, for it is clear that the owner in continuing to work them would only be adding to the world's stock of copper by a gift of something like an equal value in money, for labor alone, besides what must be allowed for interest on capital and amortisation of property. The fact that the working has been kept up for hundreds of years as in the case of many mines that are now worthless, many probably be accounted for in part at least by the formerly very high value of copper and of the precious metals compared with rice and other necessaries or comforts of like.

Map.— The map annexed, on a scale of about $\frac{1}{20000}$, was compiled with the help of Mr. [illegible], Assistant Geologist from [illegible], old fashioned sketch on a scale of about $\frac{1}{3300}$ given [illegible] the mines; from hasty sketches by me of a larger rough map of the mines and of the Dagiri mine shown me there, and from my own road sketching and shows the relative positions of the veins and other features near the principal mines besides a few geological observations of mine. No careful survey has ever been

[From the Engineering News (Kogyo Shimpo) of 4 Oct. 1879 pp. 726–729.]

"The Ashio Copper Mines in the Province of Shimo[illegible] by Shibu Mi.

"The copper of our country excels in quality [illegible] western countries, and there is not time [illegible] separately all the different places [illegible] is produced. At such leading copper [illegible] as Suruzawa in Sumbu, Ani in [illegible], Tenna in Yoshino commonly 3000 [illegible] are employed, and such a thing as [illegible] of copper (blue vitriol) is [illegible] the [illegible] refuse, it is said.[1] Such mines [illegible] of Ashio to be pure are a small [illegible] as they are reached in only 30 [illegible] from Sukiyoo,[2] men who aim at chemistry [illegible] must necessarily first turn their [illegible] thither, and make thorough acquaintance with real practice. I visited [illegible] mines a little in August, 1877, and [illegible] down what I learned [illegible] to the editor.

"The copper mines are in the middle

of Ashio Subdistrict (or Gun) and are reached in about a league from Ashi post village, passing through Mafuji village. They were first [illegible] in 1610 (15th year of Keichoo); for at that time a Bizen man came and discovered them and they became government mines under the Shoogun. It is said that in the Kiyoo-hoo period (1716–35) there were several grants of money and that in the beginning of the Gembun period (1736–40) coins were made, and those are the coins that have the character Ashio on the back. After that, money grants were stopped and the mines were worked by miners who sold the metal produced to the government. At length the mines grew worse and about [illegible] 1876 a certain man originally from [illegible] came into possession, but in March the year of my visit (1877) the Tokiyi Bank [illegible] them for $50000. According to a friend of mine who visited the place [illegible] (1879) they are said to be owned now by a certain rich man named [illegible] of Fukagawa in Tokiyoo.

"A celebrated mining engineer has said

that these mines have had their copper already more than half worked out; I do not know whether it be so or not. At the time of [illegible] the course of the veins was from [illegible] to southwest. The number of veins [illegible] is forty, within a length of [illegible] fathoms and a breadth of 400 fathoms; it is [illegible] is besides only one that is to be [illegible] with a length of 200 fathoms and [illegible] of thirty feet.[4] The highest point of the mines is about 1700 feet from the surface of the ground.[5] The width of the veins is [illegible] foot and five or six [illegible]; the width of the spots that yield good ore is extremely [illegible].

"Of the 300 men or thereabouts employed [illegible] mines (my friend says that many [illegible] are employed now) there are [illegible] and it is said that as more than half of them are farm laborers in [illegible] neighboring villages, and stop mining when farm work is active, the product is less than.

I went into the mines with a mine [illegible] a guide and with [illegible]

found there was no artificial ventilation; and took a look at a place where they were digging ore. Just at the side of the vein they bore a hole, which they fill with powder and close its mouth with a lump of clay called a ball. Then they set fire to the powder with a fuse and when the explosion takes place they easily tear off pieces of ore. When the pieces have been put into a small basket and carried on the back to the ore sorting place, several women there with hammers crush to powder the lumps of ore, and separate the inferior quality, which is used for making sulphate of copper. Then the powdered ore is put in wooden dishes or in broad baskets, and sorted by washing in water. Then the remaining heavy powder is thrown into a hearth made of clay, and a strong heat is produced with the help of bellows. When melting has taken place, they skim off the charcoal from the top, and sprinkle on water so as to stiffen the surface, which is then lifted off. When they have twice a running stiffener and taken off the matte, as it is called, the remaining melted copper is made into oblong shape by

[illegible] it in moulds with the word Ashio in raised characters. Such [illegible] in gots are from 58 to 75 pounds (seven to nine hamme) in weight.

"The hearth just mentioned yields in one day about 250 pounds (30 hamme) of copper; and occupies five men. The yield of coarse copper in one month is 100 piculs, worth $13 a [illegible]; or at Yokohama over $19 a picul; [illegible] freight to Tooking costs a dollar for [illegible] piculs.[7] From the coarse copper one fifth [illegible] refined copper is commonly obtained.[8]

"[illegible] it is hard to get large lumps of [illegible] because the veins are narrow, so that [illegible] class ore is seldom in lumps of [illegible] than a couple of pounds (200 or 300 mon[illegible]) and inferior ore, as it is called seldom more than 16 or 17 pounds (2 hamme). First class ore, too, yields forty percent. of copper;[9] second class, 20 or 30 per cent., and inferior ore, [illegible] twelve per cent. Ordinary ore yields [illegible] mamme from 300 mamme. The [illegible], as it is called, contains about 70 per cent. of copper. It is ~~[illegible]~~ broken into small pieces, roasted in a hike (the same

[illegible] kilns of the blue vitriol process), [illegible] and is pounded into fine powder and [illegible] refined copper.

"Sulphate of Copper Process.— In order to make blue vitriol with the poor ore they build kilns [illegible] five feet high and four feet across; spread [illegible] and firewood on the bottom, and on them green grass, and on that fill up with powdered ore; and then set fire and roast for several days. When the smoke has already stopped issuing, they thrust the branch of a tree in, and [illegible] the heat of this [illegible] to the hand, ~~[illegible]~~ they [illegible] many more holes with the stick and sprinkle water [illegible] Afterwards they rake the surface [illegible] and leave it so; and about [illegible] from the beginning they take the ore out.

"Then they put the white powder [illegible] [illegible] (?) cards, mix with [illegible] [illegible] day has passed open a cock, let [illegible] run into large tubs, and boil it down, and crystallize it in copper cauldrons of [illegible] in diameter.

"For this blue vitriol process there [illegible]

[illegible] 20 kilns and about 40 tubs; and the daily yield is about 83⅓ lbs (10 kamme) worth one dollar for 34⅓ lbs (4 kamme).

"The copper and blue vitriol hitherto has been sent to Oomama in Koodzake and thence by water to Tookiyoo. It is said that now the Prefecture has possession in future they will be carried with two bullocks daily to Ashio, thence by packhorse it will reach Imaichi post village and so come to Tookiyoo in boats."[10]

"My friend says that this year 2500 lbs. (300 kamme) of ore are dug daily."

Notes by B. L. L.

1. The number of men actually employed in any of the mines mentioned seems to be much less than 3000; and blue vitriol appears not to be made at any of them.

2. The distance is 36 [illegible].

3. The mines appear to have been held by the government through the Tochigi Prefecture, and worked by Soeda Kinichi, formerly of Kaga ken, for five or six years previous to March 1877, when they were bought by [illegible]

with whom Mr. Furusawa (or Furukawa) and another have been associated in business.

4. The translation here seems to be exact; but the meaning of the original is not perfectly clear.

5. The meaning probably is that the highest [illegible] is about 1700 feet higher up the mountain [illegible] lowest; as it appears to be from our [illegible] map.

6. [illegible] pyrites.

7. Compare the cost of freight here (by the [illegible] road) with [illegible] (by the [illegible] road). The price of the copper [illegible] more exactly from the table of [illegible] mining office.

8. There must be some great error here [illegible] the yield of refined copper from [illegible].

9. [illegible] copper pyrites contain only [illegible] per cent. of copper.

10. As cargo boats cannot come to Imaichi [illegible] copper is carried by land 10½ leagues further to Tochigi.

To complete the subject as far as may be, I add here a translation of a short paper on the Ashio Copper Mines by Mr. Shibu Hi, lately published in the Kooguyoo Shimpoo periodical; and make a few explanatory notes.

I have the honor to be,

Sir,

Your most obedient servant.

Kooji Mashi; Nov. 1879.

Chiba. June 29th 1871.

My dear Mr Spencer

I no doubt you will feel much interested in the Tchibugen coal field. I send you a duplicate of my report, the original I have handed to Mr Kobayashi to forward to the Fukuoka Kencho.

As far as I can see there seems a great probability that the output of coal will fall off in a few years unless something be done to improve the means of mining. You will see however all this from my report though it is very long and I fear will be tedious reading.

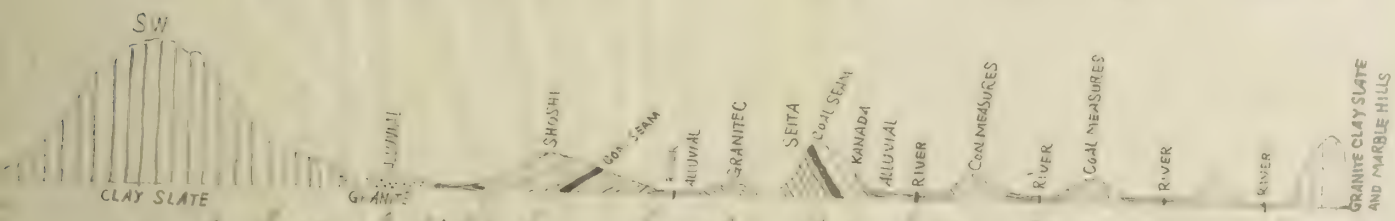
Yours very truly.

Fredk Antony Potter.

Preliminary Report on the Coal-Fields of Tchikuzen and Buzen.

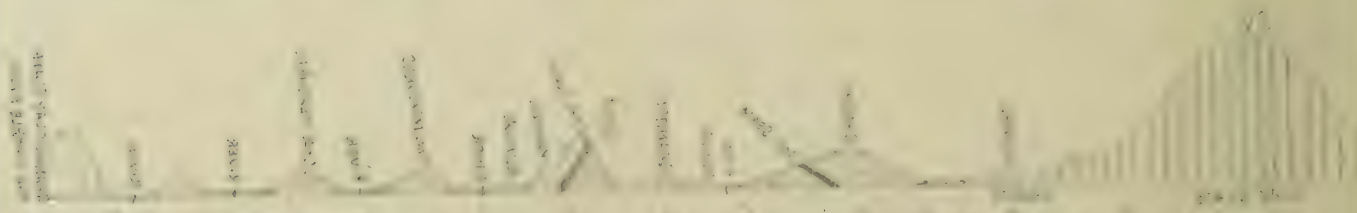
May 31st 1878.

The Coal fields of Tchikuzen and Buzen may be considered as one coal-field lying in the valleys of the main trunk and various branches of the great river which flows north westwardly and has its mouths at Tchiya and Wakamdza. Section.



accross the Coal-field from the Clay slate hills of Tassagara through Shoshi, Seita, Kanada, to the granite and clay slate and marble hill on the North East near Kawara and Seito-go.

The general feature of district is that the broad valley is terminated on the S.W side by lofty hills of clay-slate, at the base of which are low granite hills. The valley to the NE is likewise terminated by lofty hills of granite, clay-slate and marble at Kawara: these ranges of hills vary from 1000 feet to 2000 feet high and they form distinct boundaries of the great valley. In this great valley are low hills covered generalley with "Matsu" trees and from 40 feet to 300 feet high (the latter at Shoshi and Seita only) above the general level of the alluvium of the valley; these latter hills are formed of Coal measures and on them seams out crop and have been worked and they form the various areas where coal has been worked - also at various.



No 1 Sketch Plan General Plan of the Coal Mine.

KOKURA

places in the great valley are low hills of granite like that at c in the above section which represents a low granite hill near Seita: the granite hills are in close proximity frequently to the coal areas — between the various coal areas and filling up the rest of the valley are the alluvial deposits of the valley which are well cultivated with rice fields and through which the river with its various branches meanders

In the general sketch map of the district accompanying this report the general position of the lofty hills the branches of the river, and the various coal areas will be seen. It will be seen that the coal-field is divided apparently into isolated patches of coal areas which are to be found at Shoshi, Namadzuda, Seita, Kanada, Kawara-ugeta, Katzuki, and Sinio: at these places coal seams outcrop and from their outcrop they have been worked. The coals from the mines are generally transported in little carts formed of bamboo baskets mounted on two small wheels and furnished with 2 wooden handles but in those cases where the output is very small they are transported on pack horses. There is no doubt some local sale of coal and some coal is dispressed about the country on pack horses but the bulk of the coal is transported by the bamboo basket barrows to some shipping place on the nearest branch of the river: the distance from the mines to the river does not generally exceed 10 cho. At the river it is shipped

RUROTO
HOKAKA

N° 2 Sketch plan – Shoshi coal area

into long narrow shallow flat bottomed boats capable of holding about 15,000 lbs and transported down the river to Kokiya or Wakamatsu respectively, where the coal is shipped into junks.

The first place visited was the Shoshu coal area. Here they carried the coal about 30 chs to the shipping place on the most western branch of the river at a little below Sayuka. The coal area consisted of sandstone hills from 70 to 300 feet high above the general valley. The first place visited was a small valley from which other small valleys branched off like the fingers from the palm of the hand as at A in the No 2 sketch plan herewith. In this valley two seams out cropped.

The upper called the Kankan seam.

and the lower called the five foot seam

And at various places in this valley were old mines; Thus at No: 1 was an old mine on the Kankan seam which was here about 115 feet above the valley at the house at B. The seam was dipping here S. 60 E.

Also at No 2 about one chain (66 feet) distant from No 1 was another old mine on the Kankan seam about 95 feet above the datum valley; There was thus a great difference in level between No. 1 & No 2 mines in a short distance.

At No. 3 was another mine about 145 feet above the datum and here they were burning the coal into light coke- in a primitive fashion in a plain heap- probably for local consumption

At No. 4 was another mine on the Kaukan seam now working, about 55 feet above the datum, here the coal seam gave the following section and was dipping S 54 E at 16 degrees

Section of Kaukan at No 4 mine

5" inches Fireclay
5" inches coal
7" inches Fireclay
5" inches coal
1" parting
5" inches Coal
2" inches Fireclay
4" inches Inferior Coal
1' 0" very inferior dust
3' 10" Three feet ten inches

The cutting place of the Kaukan seam were some considerable distance from the mouth of the mine.

A little below the No 4 mine was another mine, No 5 mine the mouth of which was about 60 feet above the datum but the coal seam was only reached by a steep incline and where first reached was about 10 feet above the datum. This seam was called the Five foot seam and gave the following section.

Section of two foot coal

Feet	inches	
1'.	0"	coal
	2"	shale
3'.	6"	coal
	4"	batt
1'.	0"	inferior coal
6'.	0"	

The seam was dipping gently to the SE and water was running freely off from an adit cut in the floor about 4' feet deep it was not possible to proceed much more than about 50 yards to the dip as the mine was full of water and the water was up to the roof. From the [illegible] where the water stood it was alleged by the workman to have been cut only 50 kens to the dip but along the level course (Katabau) to have been cut about 100 kens— it was alleged to have been opened 15 or 16 years ago and to have been worked for 80 days and stopped on account of water but it was an old mine when opened 15 or 16 years ago; the coal pillars of this mine were all standing and the coal had been cut regularly and well.

Opposite the No. 4 & 5 mines were 5 coke ovens of the open rectangular pattern each about 14' feet long 5' feet wide and 7' feet high; alleged to have been made 5 years ago: at the time of my visit they were not working

The valley is with its [illegible]

Section of Fire foot Coal—

Feet inches.

1' 0" Coal

2" shale

3' 6" Coal

4" bott

1' 0" inferior coal

6' 0"

district

of a [illegible] valley at about 70 feet above the river and about a miles from it — the seam was dipping gently to [illegible] and the follow — is its section.

Section of seam [illegible] — [illegible] no — [illegible]

Feet	inches		
1.	0"	coal	
	1"	batt	
	3"	coal	
	1"	batt	
	3"	coal	
	1"	dirt	
	6"	coal	Three foot seam
	6"	batt	
	8"	coal	
	4"	batt	
	4"	coal	
	4"	batt	
	4"	good coal	
1.	2"	coal	
5.	11"	Carried [illegible]	

Section continued

Feet	inches		
5.	11"		Annahina seam
	6"	coal	
	4"	batt	
	6"	inferior coal	
1.	0"	coal	
	6"	parting	
	10"	coal	
1.	6"	parting	
1.	0"	coal	
	4"	batt	
	8"	coal	
12.	10"	twelve feet ten inches	

a little work was being done from the [illegible] mine in the three foot seam but the best coal had been here worked to a great extent away. There were also two old mines close by which had been [illegible] for work — the Annahina [illegible] [illegible] had been

[illegible]

[illegible]

[illegible]

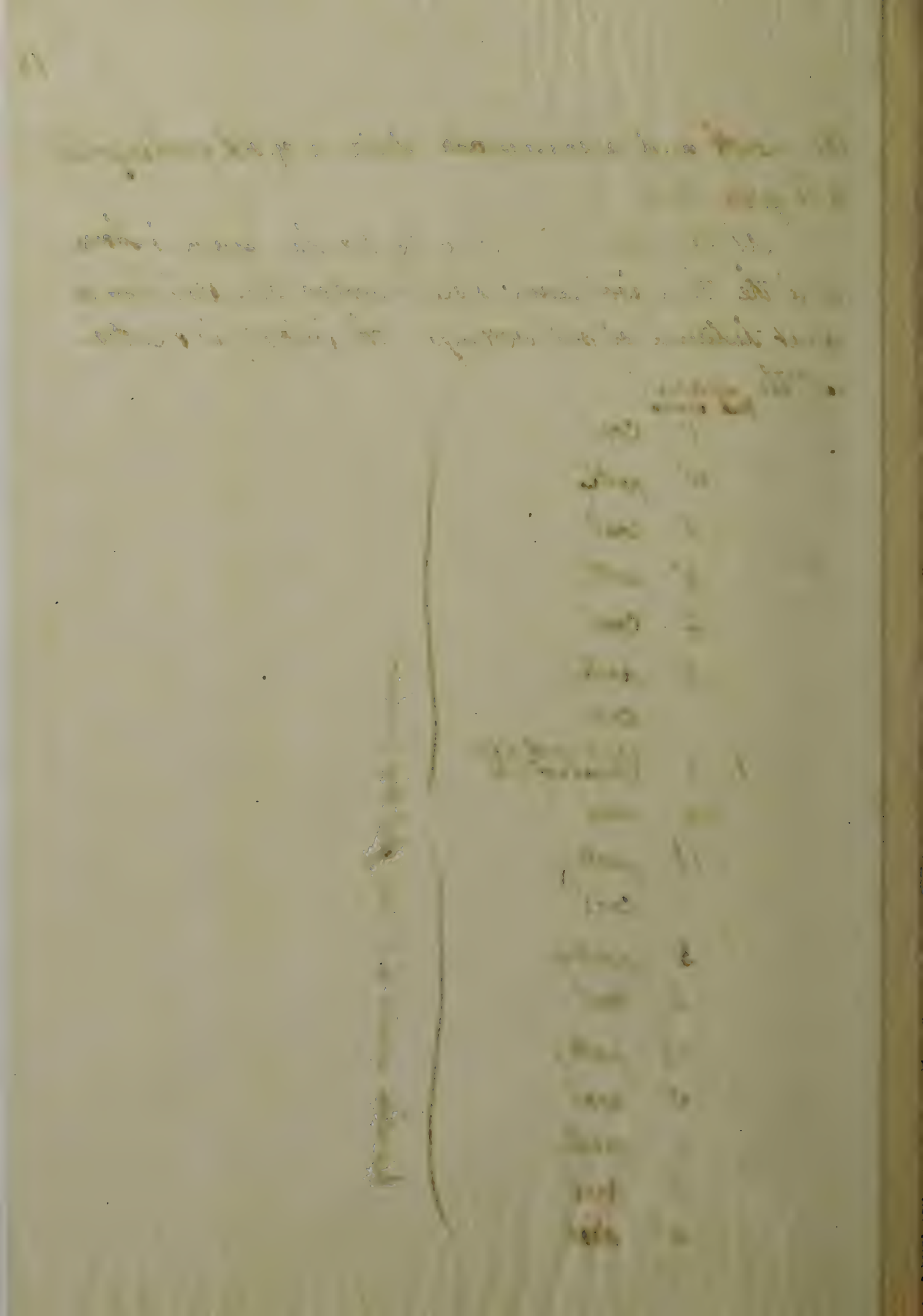
Feet inches		Section continued	
1. 0"	coal	Feet inches	
1"	[illegible]	5. 11"	
3"	coal	6"	coal
1"	[illegible]	4"	[illegible]
3"	coal	6"	[illegible] coal
1"	[illegible]	1. 0"	coal
6"	coal	6"	[illegible]
6"	[illegible]	10"	coal
8"	coal	1. 0"	[illegible]
4"	[illegible]	1. 0"	coal
4"	coal	4"	[illegible]
4"	[illegible]	8"	coal
4"	good coal	12. 10"	[illegible]
1. 2"	coal		
5. 11"	[illegible]		

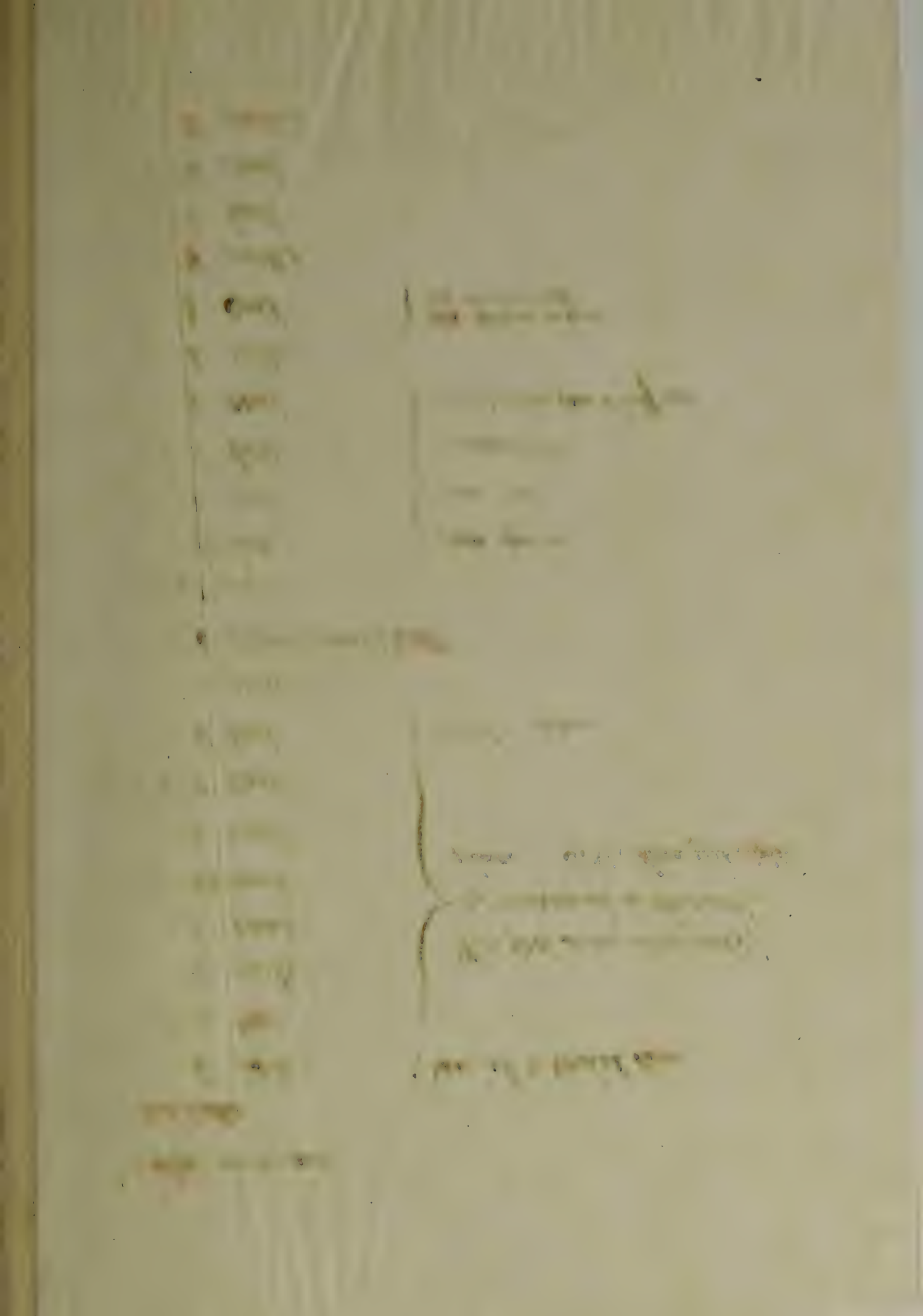
[illegible]

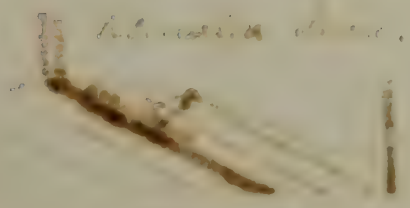
SW
NE

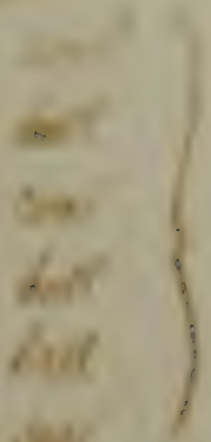
NE
SW

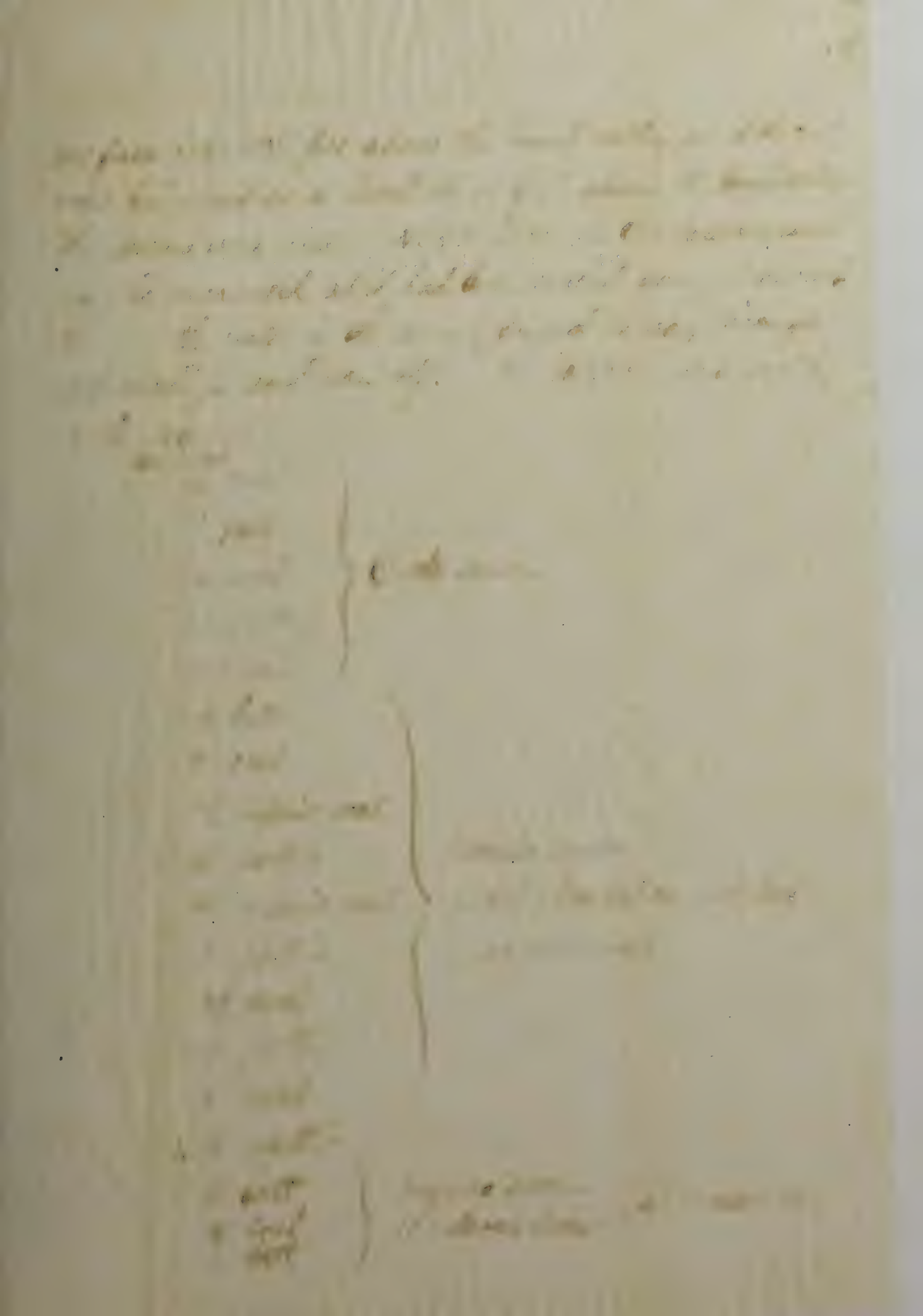
Rubia continued







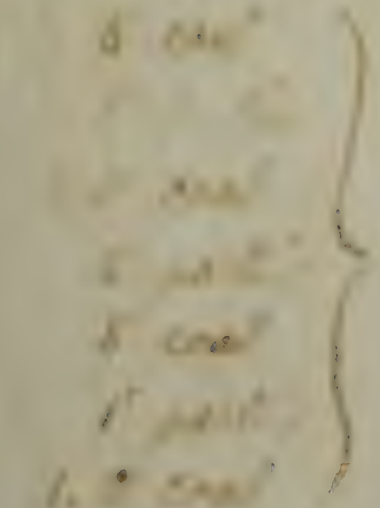




35" seconds -

briskly

Heinlein



SOME COAL [illegible] ON NEW [illegible]

[illegible] SOME [illegible] ADVANCE [illegible]

[illegible] THE [illegible] CHILD RAIL [illegible]

[illegible] A COAL [illegible] HE JUST [illegible] D BRIDGE. THE COAL [illegible]

[illegible] TO BE ABOUT THREE FEET [illegible] SOME TIME BEEN [illegible]

[illegible] THEREFORE [illegible] TO HAVE BEEN [illegible]

[illegible] THE [illegible]

[illegible]

QUARTZ. A SMALL FIST PIECE, WEATHERED BROWN. 1 A'.

(M 1107 OA) --- BARITE IN SMALL (0.02 FT.) TABULAR CRYSTALS, WITH [redacted] [illegible]

[illegible]

[illegible] QUARTZ GRAINS AND [illegible] PYRITE CRYSTALS [illegible]

[illegible] GREENISH

[illegible] OLIGOCLASE QUARTZ PORPHYRY, SAME AS THE FOREGOING. [illegible]

[illegible] GRAY MATRIX [illegible] PIECE [illegible]

[illegible] OLIGOCLASE QUARTZ PORPHYRY, SAME AS THE FOREGOING. [illegible]

[illegible] FELDSPAR [illegible] QUARTZ [illegible]

[illegible] CONTAINING TRICLINIC FELDSPAR [illegible]

[illegible] QUARTZ GRAINS [illegible]

[illegible] A SMALL [illegible]

[illegible]

QUARTZ. A SMALL FLAT PIECE, WEATHERED BROWN, 1 A'.

(M 1102 QA). --- BASALTE, IN SMALL (0.02m FT.) TABULAR CRYSTALS, WITH

(M 1102 E). ---DIORITIC PORPHYRY; CONTAINING

QUARTZ, AS A FORMING,

TAKASHIMA DISTRICT.

TAMASHIMA DISTRICT.

[illegible] SYRITE, [illegible] LIGHT GRAY [illegible] AN EGG LUMP [illegible]

[illegible] MYSITE, [illegible] QUARTZ. A SMALL FIST LUMP, GRAY AND [illegible] BROWN, [illegible]

QUARTZ, [illegible]

[illegible]

[illegible]

[illegible] SYRITE, SMALL CRYSTALS, IN GRAY QUARTZ, WITH [illegible]

[illegible]

[illegible]

[illegible] LUMP, BLACKISH BROWN [illegible]

[illegible] A LARGE EGG LUMP AND A [illegible] LIGHT GRAY AND SLIGHTLY [illegible]

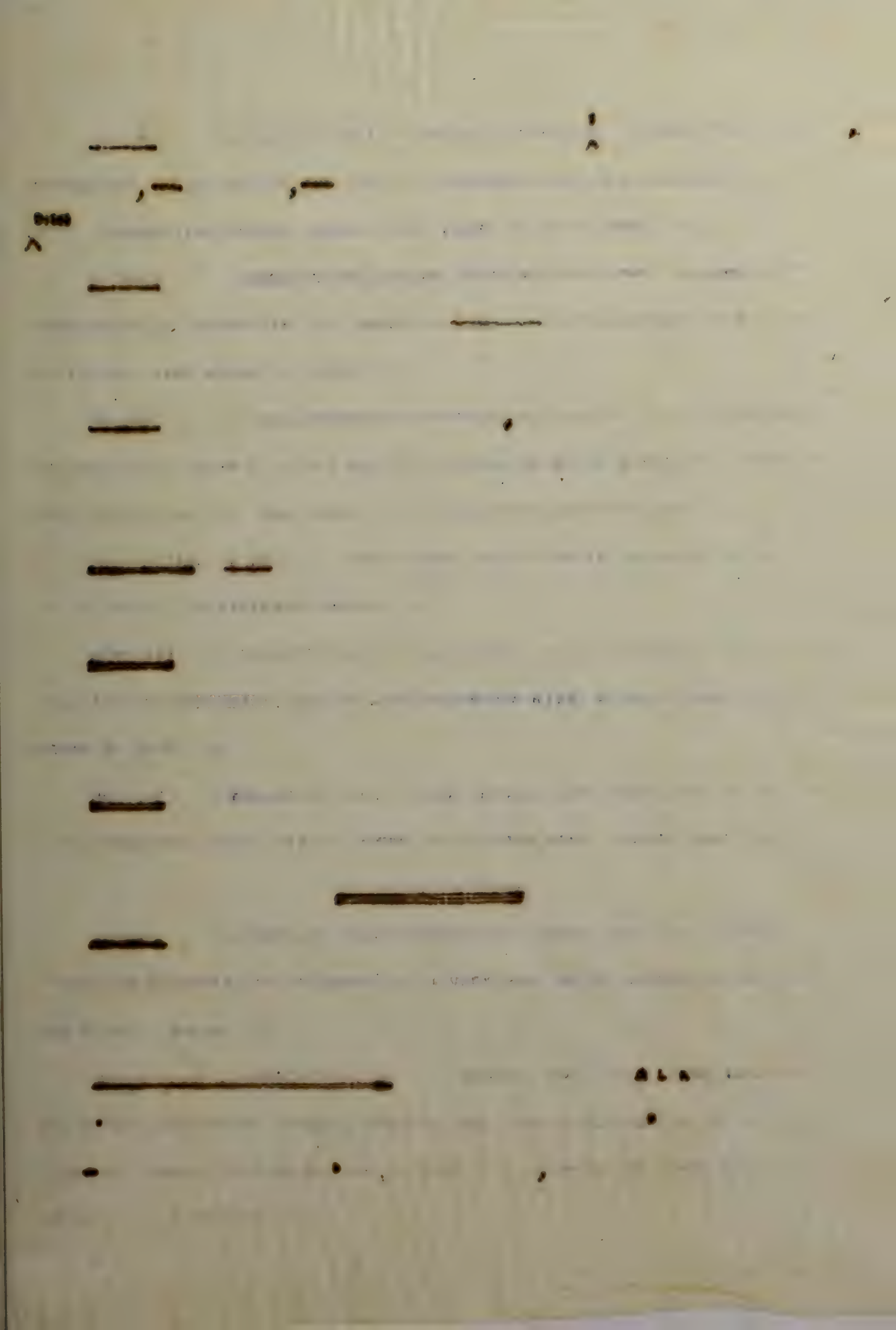
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]



TRACHYTIC

(R 126). --- [illegible] OLAR QUARTZOSE ANDESITE, CONTAINING GLASSY [illegible]
[illegible]SPAR (OLIGOCLASE[illegible]) [illegible], BLACK [illegible]
[illegible] VERY LITTLE HORNBLENDE AND TRACES OF MAGNETITE IN [illegible]
[illegible] CONTAINED VESICLES VERY WELL FILLED. THE [illegible]
[illegible] LIGHT GRAY WEATHERING BROWN [illegible]

PARTLY FISSURED

[illegible] [illegible] [illegible] NIC FELDSPAR [illegible]

SMALL DARK ANGULAR [illegible] ^

[illegible] [illegible] [illegible] [

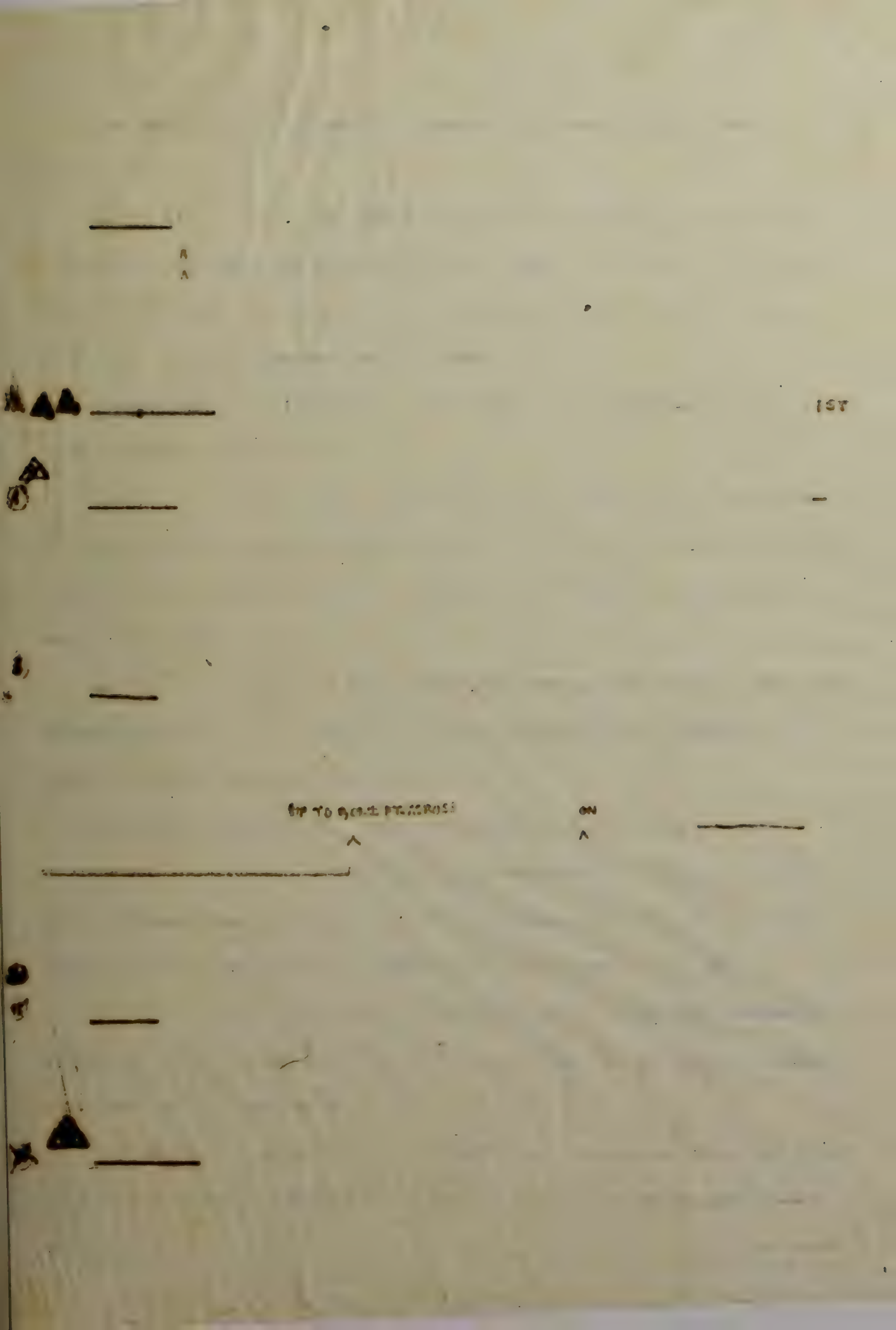
[redacted]

[redacted]

[redacted]

VESICULAR

AND



A HIST AND COURT. COUMBS, IA.

(1548-A) ANDESITE, CONTAINING

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

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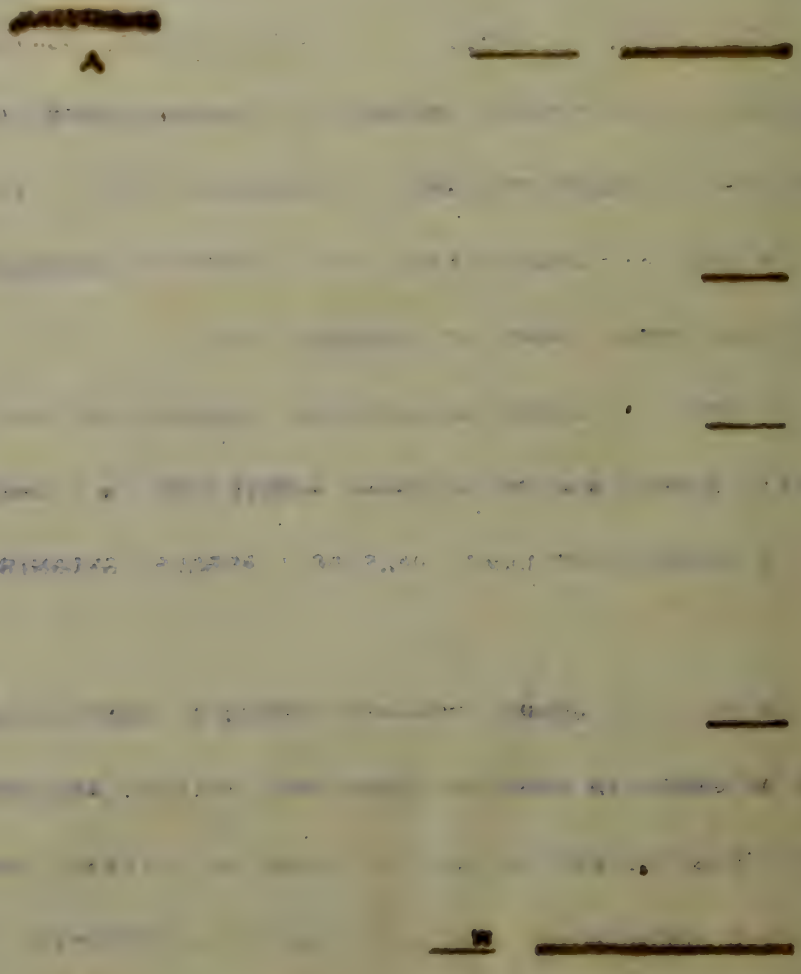
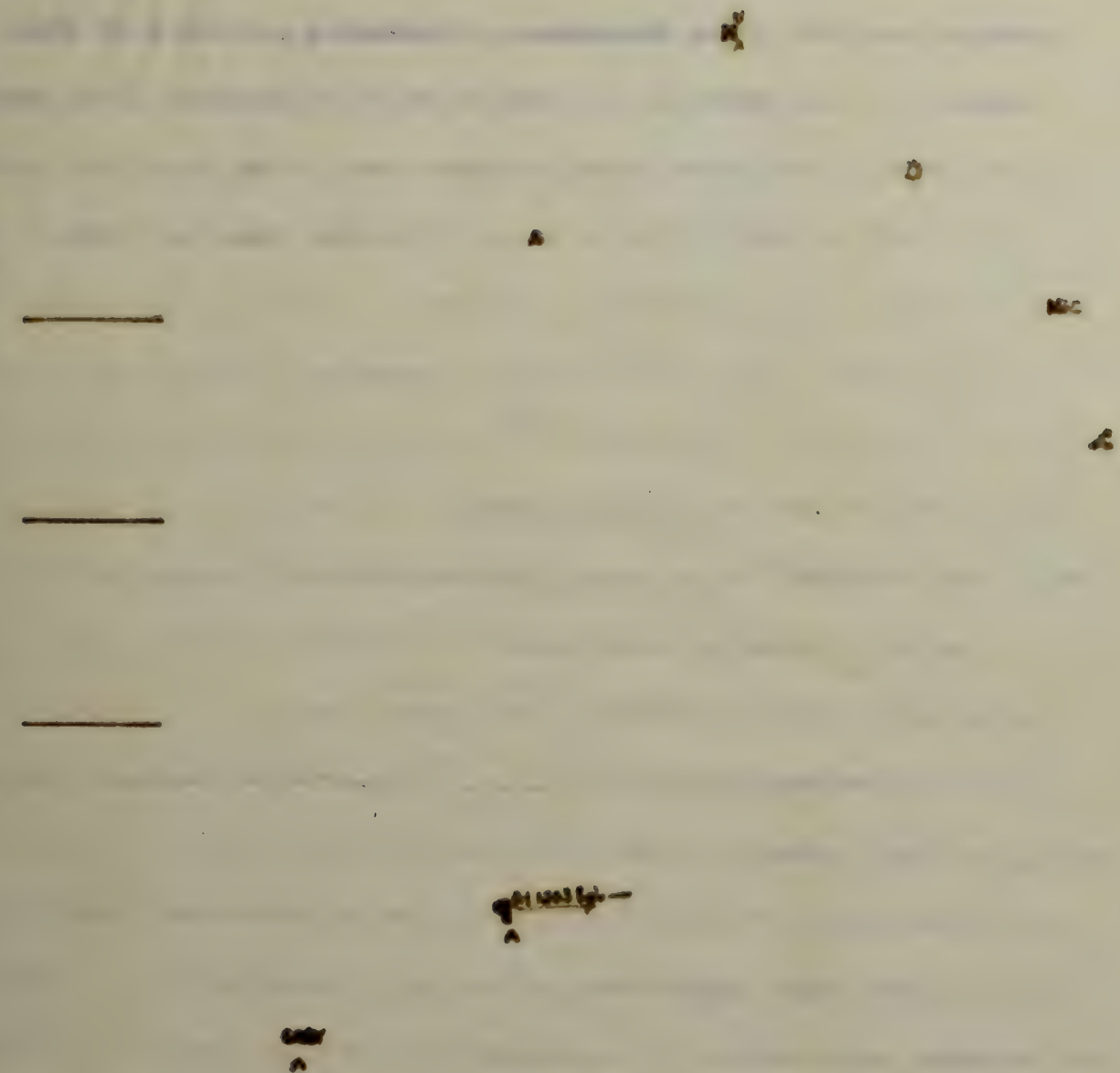


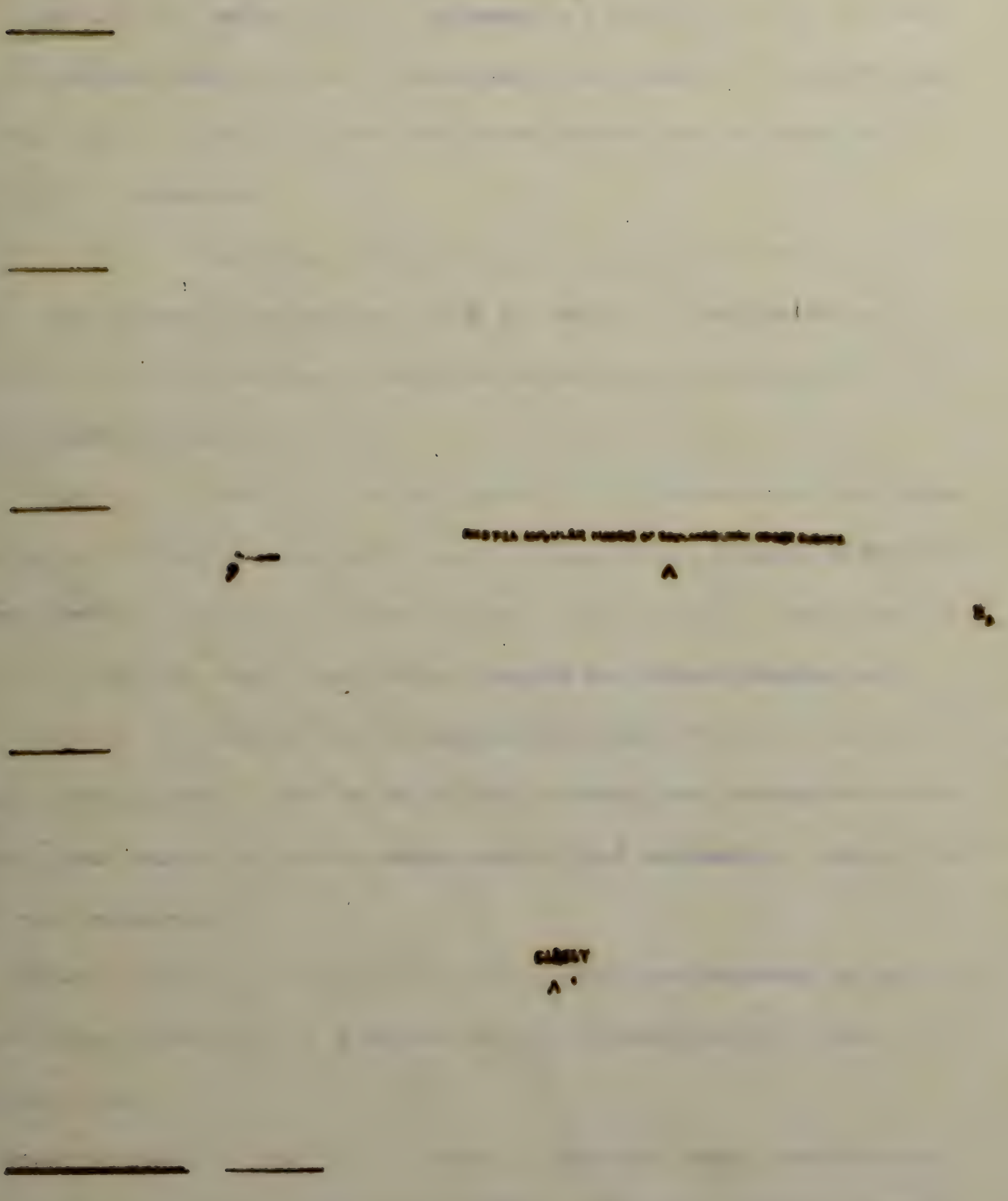
BLACKING, TRACES OF [illegible] AND FAR [illegible]

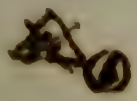
[illegible] GREEN [illegible]

HIYAMA DISTRICT.



A LITTLE [illegible] GREENISH BLACK MICA





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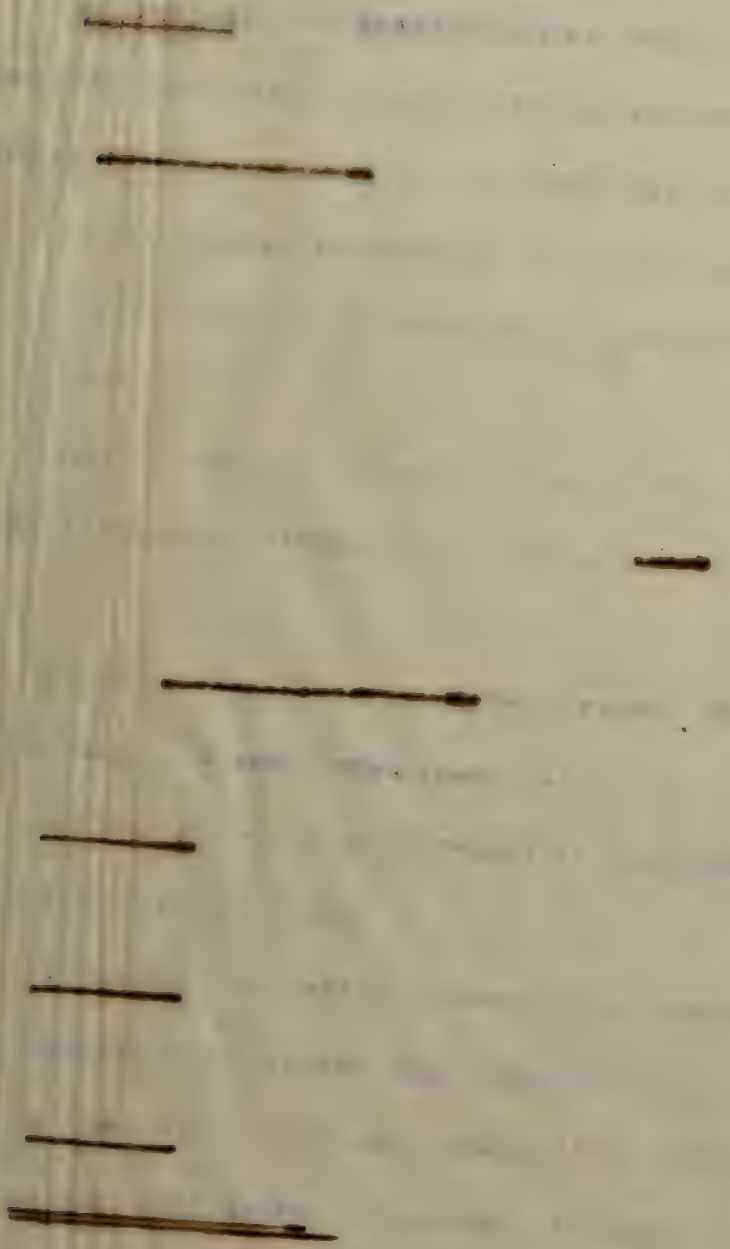
TWO EGG LAYERS,

MISCELLANEOUS PAPERS

UNBOUND
LETTERPRESS COPYBOOK
July 8, 1877 -
Nov. 3, 1877